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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

Institute of British Foundrymen.

OCTOBER 17.

Lancashire Branch (Junior Section):—Presidential address, also lecture on "The Reversing of Patterns," by F. W. Markland.

Newcastle-upon-Tyne and District Branch:—Visit to Redhaugh Gas Works.

Attached and Detached Foundries.

A scientific contemporary recently discussed from a purely scientific and technical angle the problem of the detached foundry, supplying the trade, and the foundry attached to, and mainly working for, an engineering works. Most that can be said on this problem has already been said, and the continued existence of flourishing detached foundries proves that their separate existence is justified. Circumstances occasionally induce an engineering works without a foundry to begin to make castings, but for every works that does this one can be found giving up the production of castings and relying on the detached foundry, so that a rough equilibrium is maintained. Many attached foundries purchase castings from outside as and when it suits their commercial convenience. Many detached foundries rely on lines furnished by engineering works with which they have an understanding, written or verbal. Some detached foundries become attached by absorption or partially attached; and subsequently not a few resume their independent career. All shades and gradations, therefore, exist between the extremes.

There is in these days much to be said for specialisation, and one of the arguments for an attached foundry is that it can concentrate on the requirements of one consumer. The requirements of one firm, however, are apt to be just as various as those of half-a-dozen, and many detached foundries are more truly specialised than others attached to some engineering shops which expect them to supply everything regardless of weight, size and importance.

A very small attached foundry, as our contemporary suggests, is likely to be neither economical nor efficient, but the works does not care to be dependent on outside supplies during a period of great demand. It is also suggested that an internal foundry is not likely to be so well equipped for scientific control as an external or detached foundry, but it would be as easy to quote instances of the error of this as of the truth. Everything, in fact, depends on the management, and, indeed, a capable manager will make a foundry succeed whether it is attached or detached, and in incompetent hands the fact that a foundry is attached will not save it.

Finally, it is suggested that inspection and specifications are less severe for an internal than for an external foundry, but this again is open to question. The tendency is to organise a large works departmentally in such a way that for practical purposes the machine shops and the foundry might be separate works, and in some cases assembling and machining departments have the right to buy outside if they can get better or cheaper material.

A Tendency to be Avoided.

There seems to be a tendency in some established technical institutes to allow questions of price levels, wages and even politics to creep into discussions, topics which are generally very definitely outside their ambit. Yet there is some excuse for this development, as technical progress is so intimately associated with economics. Without resorting to the dictionary, we would define economics as the science permeating business operations. Thus it seems desirable that a well-defined understanding should be reached which would allow this phase an outlet without vitiating normal procedure. Primarily, there are the annual dinners at which speakers, who are known to have pronounced political views or are interested in either employers' organisations or trade unions, are invited. Secondly, come the presidential addresses, wherein a certain amount of latitude may be allowed, but, unquestionably, no discussion should ever be allowed on their contents. Here undoubtedly, the limit of deviation from the tacit basis for the formation of technical societies has been reached, and individuals wishing to carry their personal views further should join more appropriate organisations. Experience has shown that it is during discursive discussions on costing, apprenticeship and economics that questions of wage rates, price levels and politics are liable to enter, and it thus behoves chairmen to rule the meeting with an iron hand. This is not only in the interest of the society but usually for the benefit of the individual, as the expression of opinion on these matters, normally excluded by common consent, will not be appreciated equally by all with whom he makes contact during business hours. There is, obviously, a wealth of experience behind the banning of commercial and industrial discussions by technical societies, and though progress often demands change of outlook, yet we counsel extreme caution before tampering with this particular phase.

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New I.B.F. Section Inaugurated at Lincoln.

The opening meeting of the newly-formed Lincolnshire Section of the Institute of British Foundrymen was held on October 3. The members visited the foundries and erecting departments of Ruston-Bucyrus, Limited, Lincoln, by the kind invitation of the directors, and under the personal direction of Mr. J. Feasey, general manager to the Ruston companies. Mr. Feasey is the first chairman of the new Section.

About 20 members of the Section were present, and were supported by 60 members of the East Midlands Branch, to which Branch the new Section is connected. On conclusion of the visit, the firm kindly provided tea, and also allowed the use of their canteen for the meeting which followed. Amongst the guests were Mr. A. Harley, President of the Institute, and Mr. T. Makemson, the Secretary.

Mr. Harley proposed a hearty vote of thanks to the directors of Messrs. Ruston for their courtesy and coupled with this the name of Mr. Feasey. He also thanked the members of the staff for the very able way in which they had conducted the party over the works. Mr. Harley complimented the firm upon its splendid equipment and especially upon the general neatness and cleanliness of the entire works. He said he was delighted at having the opportunity of visiting the works, and was amply repaid for his 80-mile journey from Coventry to Lincoln.

The proposition was seconded by Mr. T. Spiers, President of the East Midlands Branch, and Mr. Feasey suitably replied.

At the evening meeting, Mr. Feasey said it gave him the greatest pleasure for his first duty as chairman of the Lincolnshire Section to ask the President, Mr. Harley, to give an address.

Mr. Harley said he did not intend to speak for very long, as he thought the Paper to follow was of far more importance. It was fitting that his first Presidential visit should be to the opening meeting of the new Section, which is an effort further to extend the activities of the Institute. He was pleased to visit Lincoln, which in some ways resembled Coventry, being a very old city of interesting and historical associations. But that was not all; Lincoln was noted industrially throughout the world. He remembered his first visit to Lincoln, at the invitation of Mr. (now Sir) William Tritton, the inventor of the "tank," to visit the works of Wm. Foster, Limited. At that time the Daimler Works were engaged in making the engines for the new invention, but so closely was the secret guarded, that he had no idea of the details of the "tank" until that visit to see the first assembled tank in action. The whole country must have been proud of that wonderful invention.

He could assure the new Section of his heartiest wishes for success, and the General Council would do all possible to assist. In Mr. Feasey the Branch was lucky in its first chairman. Branches were not run successfully by the efforts of one or two, and he appealed to all foundrymen to give their whole-hearted support to the new venture. It said a good deal for the enterprise of the officials of the East Midlands Branch, who were the sponsors of the new Section. Apart from the technical advantages of being a member of the Institute, there was another valuable point. That was, in debates, the encouraging of the young members to tell others what they knew of foundry work. Over and over again it had given him pleasure for a man to tell him something he knew. He would advocate the importance of debate.

Mr. Feasey then called upon Mr. F. S. Wordsworth, the hon. secretary of the Lincolnshire Section, to give his Paper, "The Metallurgist in the Foundry."

Mr. Wordsworth's Paper will be printed in our next issue.

I.B.F. Branch-Presidents.

SCOTTISH BRANCH.

Mr. N. McManus, M.B.E., is a native of Barrow-in-Furness. He served an apprenticeship with the Naval Construction & Armaments Company, Limited, and then entered the firm of H. Watson & Sons, engineers and founders, at Newcastle-upon-Tyne. He spent some time in the drawing office and later assumed control of the machine shops. For a time he was machine-shop foreman with W. H. Bailey & Sons, Salford. Returning North, he joined the staff of Armstrong, Whitworth & Company, Limited, Elswick Works, and, later, C. A. Parsons, at the Heaton Works. From these works he returned to H. Watson & Sons as works manager, leaving after 9 years' service at the request of the Ministry to establish a shell factory in Dundee, which was one of the most successful in the country. He

Mr. N. McManus, M.B.E.

remained in Dundee after the close of this factory and went to the engine works of the Caledon Shipbuilding & Engineering Company, Limited, as works manager. In 1920, Lord Weir decided to form a company and build a foundry on entirely new lines. Mr. McManus was entrusted with the task of its building and equipping, the success of which must have given satisfaction to all concerned. Mr. McManus is managing director of this, The Argus Foundry, and now controls the foundries of Messrs. G. & J. Weir, Limited, Cathcart. In January, 1918, he was created M.B.E.

Iron and Steel Production.

The National Federation of Iron and Steel Manufacturers in their "Statistical Bulletin" for August state that it is not surprising that the present position of economic uncertainty should have accentuated the depression in the iron and steel industry, and that the combined effect of reduced demand, falling prices and holiday influences was to reduce Great Britain's production of iron and steel in August to the lowest level reached since the war, except during periods affected by coal stoppages. The number of blast furnaces in operation declined by 6 to 64; production of pig-iron, which was 317,000 tons in July, fell to 275,700 tons in August, and steel ingots and castings from 428,700 tons to 357,300 tons.

Random Shots.

I, too, dear hearts of oak, listen with no enchanted ear to this babble o' Safety First. Granted, that every man jack of us concerns himself with safety; self-preservation is the strongest instinct of mankind, and no one jeopardises life or limb without the best of causes. But this latter-day cult of Safety First, this bee in almost every welfare supervisor's bonnet, is extraneous to our everyday industrial activities. The British workman (to whom good luck) takes ordinary risks and ordinary, not super, precautions. That a coterie of Victoria Street alarmists should strive to distract his attention by flamboyant posters, and persist in preaching tedious sermons on the text of Safety First, seems to "Marksman" to border on the fantastic.

* * *

To be explicit: The principle of safety first should be so presented to every entrant to industry by his fellows that he regards it as part of the equipment essential to reliable craftsmanship. And this accessory to reliability has been magnified unnaturally into something smartly psychological.

* * *

Not often is Safety First violently criticised in the Press, and hardly ever in a works magazine. Glancing through this autumn's "Armstrong-Whitworth Record" (so ably edited by Mr. F. C. Harrison), it was, then, with some surprise that I spotted the heading of "'Safety First' Be Damned!" Some of the plain-spoken comments contained in the text are reproduced below:—

People who shout for "safety first" are dead already.

If you want to conduct your business as your father did ——

If you intend to abide by the ancient landmarks ——

If you want to avoid all risk ——

Get out!

Choose any way you like of getting out. *But Get!*

The only place for "safety-first" business men is the cemetery.

* * *

One of this month's accident-prevention posters, by the way, carries the message of "Inspect Your Ladders." What effect will this have in the shops where female labour is employed?

* * *

Here follows a story for January 1:—The circus strong man picked up a lemon, squeezed it in one hand so that pips and pulp fell to the floor, and then offered a five-pound note to anyone who could squeeze out another drop of juice from the lemon. A small careworn individual stepped forward and with effort squeezed out several more drops of juice. The strong man was astounded.

"Of what profession are you?" he asked.

"Oh, an income-tax collector," was the reply.

* * *

Question Time.

Having heard some unofficial reports of the International Foundry Conference in Italy, "Marksman" would like to know—

Who asked the most questions?

Who "passed the baby" to the General Secretary?

If the next I.B.F. Banquet will be held at Biffi's?

The secret of the popularity of the Highlander.

Marksman.

The Pan-European Foundry Congress at Milan.

TOUR OF ITALY'S INDUSTRIAL REGIONS.

The official programme of the International Foundry Congress in Italy consisted of, first, the Congress and numerous visits to works in Milan, secondly, the tour through industrial Italy, and, lastly, the closing meetings and sightseeing tours in Rome. The Milan Conference and the closing meetings have already been described in these columns, and these concluding notes will be devoted to a description of the second section of the proceedings, the tour of industrial Italy.

On September 16, about 70 members of the Congress and ladies left Milan by afternoon train, and alighted at Chivasso, near Turin, where they transferred to motor-coaches and proceeded northwards into the Italian Alps. The majority of the party (party B) terminated their journey at St. Vincent, some 70 miles from Chivasso, whilst about 25 (party A) continued 15 miles farther and spent the night at Aosta, a city famous in Roman days, with many monuments of the Romans and situated at the foot of the Great St. Bernard Pass.

Visit to Cogne.

On the following morning, party B arrived from St. Vincent, and the combined party visited the iron and steel works of the Società Anonima Cogne at Aosta. A description of this modern and well-equipped works, which produces special steels of all descriptions, appeared in our last issue. After lunch, which was provided by the company, all the visitors proceeded farther into the mountains to Courmayeur, at the foot of Mont Blanc. A couple of hours' stay in this delightful Alpine village permitted some of the visitors to make their first inspection of a glacier. Party B then returned to St. Vincent, and on the following day visited the Olivetti typewriter factory at Ivrea, in the morning, and one of the Fiat factories at Turin in the afternoon. Party A proceeded from Courmayeur to Cogne, a typical Italian Alpine village, 4,500 ft. above sea-level.

The following morning was given up to visiting the mines of the S. A. Cogne, situated on the mountain side, 8,000 ft. above sea-level, and therefore some 3,500 ft. higher than the village of Cogne. Small parties left the hotel by motor-car at intervals from 7 a.m. onwards, and proceeded up the valley to an aerial-rope railway, up which they were hauled to the mine. The entrance to the mine commands a wonderful view of numerous Alpine peaks in every direction; Mont Blanc to the north, the Gran Paradiso, with its snowfields and glaciers, and many other giants formed a magnificent panorama in the clear early morning light, and it was with some reluctance that the visitors disappeared underground to commence the inspection of the mine.

The Cogne Iron Mine.

The Cogne mine produces a very pure form of magnetite, which is transported to Aosta and smelted in the blast furnaces inspected on the previous day. The mine is so difficult of access that the majority of the workmen live in a large and well-appointed barracks at the mine. They have their own kitchens, bakery and recreation rooms, and there are two hospitals, one for infectious diseases and one for accidents and general illness. Fortunately, there were no inmates in either hospital at the time of the visit. The compressor house, power house and workshops were inspected; then waterproof overalls were donned and the visitors were hauled into the mine on a miniature train pulled by an electric locomotive. Owing to its peculiar situation on the mountain side, the mine is entered horizontally at the lowest workings, and access to the upper workings is obtained by a series of lifts inside the mine. At present workings are being carried out to a height of 350 ft. above the entrance.

The method of transporting the ore to the works at Aosta is of interest. The Cogne valley, above which is situated the mine, and the Aosta valley, in which are the blast furnaces, are two adjoining valleys at an angle of 60 deg. The ore is lowered from the mine to the village of Cogne in baskets on the aerial railway. It is then loaded into railway trucks and hauled by electric locomotives through a tunnel five miles long emerging in the adjoining Aosta valley at an altitude of about the same as the village of Cogne—4,500 ft. The altitude of Aosta is 2,000 ft., and the material is lowered down to the furnaces on another aerial railway. Transport is, therefore, speedy, and there is a minimum of disfigurement of the unique alpine scenery.

The inspection was followed by luncheon, kindly provided by the Cogne Company, and then commenced the descent to the village. The knowing ones used the aerial railway, but the adventurous members of the party decided to descend on foot and discovered that it is not nearly so easy to descend a mountain as it appears from the top; it was, therefore, a somewhat dishevelled party of foundrymen who straggled into Cogne in the blazing sunshine in the afternoon. Luggage and passengers were immediately packed into the motor-coach for the 100 miles' journey to Turin, which was reached four hours later.

The Fiat Works.

Saturday morning, September 19, was employed by both parties in visiting some of the works of the Fiat Company. The visit of party B to the motor works on the previous afternoon has already been described in these columns. A commencement was made with the steel foundries which, in addition to producing steel castings required by the company, carry on an extensive business in general steel castings of all descriptions. Four large electric furnaces are in use. It is impossible in a very short visit to absorb more than a general impression of a vast steel foundry such as this. Features which were noted, however, were the spaciousness of the foundry, the facilities for transport of materials and castings, the general orderliness and absence of confusion in transport and the ample working space provided. As in most foundries visited in Italy, much attention is devoted to sound preparation and conservation, and every process and every step in manufacture is under careful laboratory control.

The Fiat Grandi Motori, that is, the works in which large Diesel engines are made, was next visited. Like all the Fiat works, this factory is modern, well planned and splendidly lighted. The iron foundry produces a large variety of the high-grade castings required for this class of work, and the work produced varies from small detail work made on machines to crank cases of the largest size. There is a light and spacious pattern shop, and the extensive machine shops are exceptionally well laid out and equipped with the most modern machine tools.

Perhaps the most spectacular and impressive section of this works is the erecting shop, said to be one of the largest shops of its kind in Europe. There would appear to be little shortage of work in this branch of engineering in Italy as a number of engines up to 3,000 h.p. were either in course of erection or on test. Most of these engines are for use in ship propulsion and many of the smaller ones for marine auxiliary work.

Diesel Engine Works and Cylinder Foundry

The Fiat Diesel Engine works is an impressive example of the industrial importance of modern Italy. Manufacturing a product which demands technical knowledge and experience of the first order, a rigid control of materials and operations and manipulative skill of the highest class on the part of its workmen, this works must surely rank as one of the foremost engineering establishments in Europe.

The motor-cylinder foundries were the last of the series of works in the vast Fiat organisation which were visited. The foundry is operated on mass-production lines, the now familiar conveyor system being adopted. Moulds are produced on machines and placed on the conveyor, and then pass along to a suitable point where they are cored, the core-making department and core ovens being situated near at hand. At another stage of the conveyor journey, the moulds are closed and casting is carried out as they pass close to the cupolas. The moulds then pass to the cooling hood where they are cooled, and at the shake-out table the castings are removed and the sand shaken out.

A similar plant for the production of smaller castings for various automobile parts is in operation in an adjoining building. Careful attention is given to sand storage and mixing, and oil-sand cores are extensively employed.

Comparing this foundry with other motor-cylinder foundries which have been visited from time to time, the Fiat foundry would appear to have solved the problem of utilising the conveyor system and of operating labour and time-saving machinery without extravagant expenditure of capital. All the appliances appeared to be working to capacity, there seemed to be little or no redundant or unnecessary plant, and the general impression was that of an intelligent and economical application of the best that modern foundry equipment can offer.

Turin and Genoa.

Saturday afternoon was spent in sightseeing in Turin. Later a reception was given by the Mayor, and in the evening there was a banquet, offered by the Chamber of Commerce.

Sunday morning was occupied by the railway journey to Genoa, and an exceptionally warm afternoon was spent in sightseeing round the city. The tour of the city terminated at the Town Hall, where the Podesta (Mayor) received the visitors, and in a delightfully informal manner showed them some of the city's priceless works of art and some of the city's records. Of particular interest were a number of original letters written by Christopher Columbus, a native of Genoa. Mr. Vincent Delport expressed to the Mayor the thanks of the visitors and their appreciation of the delightful hour he had given them. In the evening all the party met for dinner at the restaurant Righi, situated on the hills at the back of the city, and Mr. Léonard, President of the Belgian Foundrymen's Association, took the opportunity of expressing the appreciation of the party of the indefatigable work of Dr. Guido Vanzetti, who acted as guide, philosopher and everybody's friend throughout the tour.

Port of Genoa Visited.

On Monday, September 21, alternative programmes were again offered. One party proceeded along the Mediterranean Coast to Savona, and visited a number of works. The other party spent the morning in visiting the Port of Genoa. The new Maritime Station, which has just been completed, enables the port to deal expeditiously with its increasingly large ocean passenger traffic. The harbour, which is the largest on the Mediterranean, was inspected from a small steamer, placed at the disposal of the Congress by the port authorities. Opportunity was also taken to inspect a large electric generating station situated on the harbour side.

The visit to the port was followed by a drive to Portofino, where the party was entertained to lunch at a restaurant situated some 1,500 ft.

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above sea-level, and commanding an entrancing view of the coast. The ladies continued the drive to Rapello, whilst the male members of the party returned to Genoa and visited the Ansaldo Works. Later in the evening all the tourists left by night train for Rome, where they arrived on Tuesday morning, and the remainder of the day was spent in sightseeing in the Eternal City.

The Terni Hydro-Electric Station.

Most of the tourists participated in a two-days' tour in Umbria, the fascinating and beautiful province in the centre of Italy, renowned for its vineyards and olives, and for its interesting hill-towns, full of the romance of Roman and Mediæval history. Rome was left by motor-coach at the early hour of 7 a.m., and after three hours' rapid driving through miles of vineyards and olives, a halt was made at Terni, where the large hydro-electric generating station was inspected. Power is supplied from this station to cities as distant as Naples, and when the present extensions are completed, it will be one of the largest hydro-electric stations in the world. The reservoir lies high up in the neighbouring mountains, and, owing to the diversion of streams to the reservoir, the water supply of a once spectacular waterfall has been cut off and the waterfall no longer exists. For the benefit of the visitors, however, the controlling sluices were suitably manipulated, and in a few minutes the waterfall resumed its interrupted activity. A turn of the wheel, and it dried up again—truly a waterfall made to order. The journey was continued to Assisi, where a halt of two hours enabled the party to ramble through the streets and churches of the quaint old city of St. Francis. A further ride of a few miles brought the party to Parugia, where the night was spent.

Return to Rome.

Perugia, the capital of Umbria, is situated on a hill, and it commands wonderful views of rich agricultural country on the one hand, and of the Apennines on the other. The whole of a morning was spent in inspecting the city as guests of the Mayor, who had kindly provided coaches and guides. There are few cities which preserve their mediæval character so completely as this entrancing hill-town of Umbria. After lunch the return journey to Rome was commenced. An hour was spent at Orvieto, famous for its wine and a veritable fortress on its hill, which rises precipitously out of the surrounding country. After a further halt at Viterbo, the journey to Rome was resumed, and the city was reached in the evening at the close of a strenuous but more than interesting trip. Further opportunities for sightseeing in Rome were available during the succeeding few days, and it was during this period that the closing meeting of the Congress was held in the Campidoglio. After the Papal Audience on the Sunday, the majority of the tourists commenced their journeys to their respective homes.

In Praise of the Hosts.

This conference, exhibition and tour were the first events of their kind to be organised in Italy in connection with the foundry trade, and the success which was achieved by the organisers deserves more than a passing reference. The arrangements were planned so as to show the foreign visitor the best of the industrial plants, something of the scenic glories of the country, the wonderful cathedrals and monuments of the Middle Ages, and the wonders of ancient Rome. To achieve this object required considerable work on the part of those responsible for the arrangements, and all who took part were appreciative of the success of these efforts. Hospitality was received from the municipalities and from the Chambers of Commerce of all the cities which were visited. Parties were entertained to considerable private hospitality, including a delightful gathering at the home of Comm. Vanzetti, another gathering at the home of Professor Sirovitch in Rome, and a very pleasant little dinner party in Rome at the invitation of a number of Italian friends. Everywhere and at all times the visitors were hospitably and more than cordially received and entertained.

To Comm. Vanzetti is due much of the credit for the success of the gathering. Its inception was due largely to his enthusiasm, and, as chairman of the Executive Committee, he was responsible for directing the organisation. The thanks of the visitors are also due to his son, Dr. Guido Vanzetti, who was indefatigable in his efforts to ensure the comfort of all the visitors, and who found no detail too trifling for his attention. Appreciation is also due to the various Italian national organisations responsible for the promotion of the Congress and Exhibition, particularly the General Fascist Confederation of Italian Industry.

Pig-Iron Production in Holland.

EXPORTS AMOUNTING TO 225,000 TONS.

The report for 1930-31 of the Koninklijke Nederlandsche Hoogovens en Staalfabrieken states that the main expenditure incurred during the year was on account of the third blast furnace, the cost of which has now been fully paid. No building operations of any significance are on the programme for the new financial year. The directors state that the first phase of development of the undertaking has now been completed, namely, the smelting of ore in two blast furnaces, the by-products from which and the resulting gas being almost fully utilised. Mention is made of the establishment by the company and the Eerste Nederlandsche Cement Industrie, N.V. (Enci), of the Cementfabriek-Ijmuiden (Cemij) at Maastricht, which began production last June.

The report proceeds to state that the part played by the undertaking as an exporter of pig-iron is already very important. The producing capacity of the two furnaces amounts to 275,000 tons per annum, with the third furnace held in reserve, but of this quantity only about 50,000 tons can be disposed of in Holland. As an exporter of about 225,000 tons per annum, the undertaking is one of the chief suppliers of pig-iron in the world markets. It is considered satisfactory to be able to mention that the gas question has been solved in co-operation with the Bataafsche Petroleum Mij. (a nitrogen-producing undertaking) and with the local provincial electricity works. The conviction that strength lies in co-operation induced the directors in the past year to adopt this principle with the firm of Dumont Wautier for the working of the company's limestone quarries and limekilns. The directors consider that the situation which has thus arisen in the way of surrounding the parent undertaking with a number of independent ancillary works, each of which fills a special task, offers advantages in many respects. It has only been possible in this way to solve the problem of completing the principal undertaking without placing too great demands on the company's financial resources.

Future Developments.

It is considered that the future development of the undertaking will be in the direction of the working up of the pig-iron into castings and/or into ingots and rolled-steel products. Along this line the undertaking will become of increasing importance to Holland. The total production of pig-iron in the year amounted to 266,708 metric tons, as compared with 260,181 in 1929-30; and of these quantities the sales in Holland were 40,632 tons and 54,809 tons respectively in the two years. The manufacture of coke reached 285,100 tons, against 250,123 tons, and the electricity station supplied 40,278,000 kw.-hrs. to third parties as compared with 38,712,000 in 1929-30.

Since the beginning of the calendar year—the report states—the rate of production at the two blast furnaces and the coke ovens has been slightly restricted, but the exports of pig-iron have been fairly well maintained, despite the fact that world prices have shrunk since 1929 by about 50 per cent.

After having made provision for depreciation, the accounts show net profits, including the balance forward, of 111,485 florins, as compared with 441,856 fl. in 1929-30. The directors recommend the payment of a dividend of 4 per cent. on the cumulative preference shares, as in the previous year.

Book Review.

Foundry Work and Metallurgy. Edited by R. T. Rolfe, F.I.C., Published in about 26 weekly parts by Sir Isaac Pitman & Sons, Limited, 39, Parker Street, Kingsway, London, W.C.2. Part 1. 1s. net.

We do not intend making an extensive commentary on this first issue, as it may or may not be representative of the whole series, but reserve to ourselves the right of criticising the whole series after, say, a dozen issues have appeared. This first volume contains the Editor's Note, a short introduction by ourselves, Patternmaking, by William G. Walker, and the opening paragraphs of Section II—Moulding and Coremaking. Section I is comprehensive, informative and modern. The illustrations are well chosen and reproduced, whilst the sketches are clear and easy to follow. The only adverse comment we have to make is that, as the series is intended for students, a short selected bibliography might usefully be given. From the list of contributors announced and from the contents of Vol. I, we strongly advise our readers to give the series an extended trial. Though it is impossible to judge of future issues from what is at present available, there is every reason to anticipate excellent material.

Catalogue Received.

Finishing.—The Aerograph Company, Limited, 43, Holborn Viaduct, London, E.C.1, has sent us an 8-page pamphlet entitled "Finishing Equipment for the Electrical Industry"; and whilst we have perused this most carefully, we can see no excuse for such a title. For instance, a view is given of one of the shops of Messrs. John Wright & Company, who have achieved a reputation as manufacturers of gas stoves, though no doubt they do also make electric cookers. As but relatively few finished jobs, lending themselves to Aerograph treatment, are devoid of castings (actually 50 per cent. of the products listed contain castings), it is our considered opinion that this excellent brochure would be better addressed to the foundry industry, not even confining itself to the light-castings section, as the agricultural implement, domestic hardware and electrical castings all deal in coloured productions. We were pleased to receive this brochure, as we regard the Aerograph Company as an ally in our fight against gum and milk products, rubber substitutes, weldings and even drop forgings. Castings lend themselves to the production of artistic shapes, which, when allied to suitable colourings, place them ahead of most of their competitors when ultimate sale is to be made to any other than a hard-headed engineer. We confess to a certain amount of surprise when we learnt from the catalogue that the Aerograph Company sells sand-blast equipment, compressors, enamelling furnaces and other fettling-shop furniture. Finally, we congratulate the publicity department of this concern upon the production of an extremely striking booklet, our sole criticism being, as stated, the confining of its appeal to the electrical industry.

New Companies.

Medlicott & Wheatley, Limited, 12, St. Paul's Square, Birmingham.—Capital £200. Iron and brass founders, etc. Directors: S. J. E. Medlicott and H. R. Wheatley.

Aluminium Brass & Diecasting Factory, Limited, 14, Church Street, Islington, London, N.—Capital £1,000. Directors: G. S. Loraine, I. R. Van Wart and Dorothy R. I. Loraine.

Austenitic Cast Irons.

By J. E. Hurst (Technical Director, Sheepbridge Stokes Centrifugal Castings Company, Limited).

Austenite is familiar as the name given to the constituent which appears in rapidly-quenched iron-carbon alloys. In plain iron-carbon alloys this constituent is preserved best by quenching those alloys containing from 1.0 to 2.0 per cent. carbon from a temperature of 1,000 deg. C. in ice-cold water. The austenite constituent is generally regarded as a solid solution of the carbon in γ-iron, and the Ar_3 point

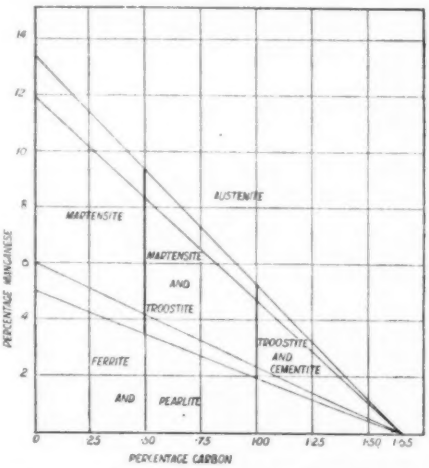


Fig. 1.—Showing Normal Structure of Iron-Carbon-Manganese Alloys.

represents the lower limit of temperature above which this constituent exists. Its preservation in the true form in the plain iron-carbon alloys requires very rapid and effective quenching, and even under favourable conditions not more than about 35 per cent. of the structure can be preserved in this form.

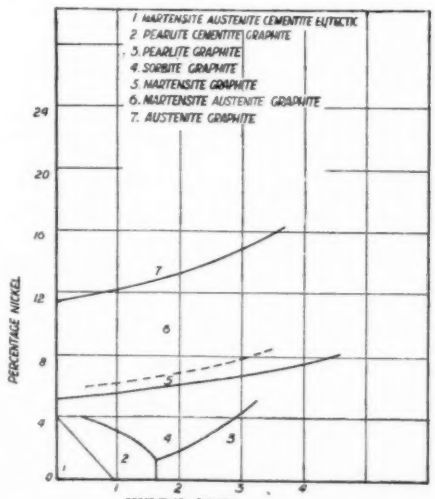


Fig. 2.—Influence of Nickel on Cast Iron containing 3.5 per cent. T.C. and Varying Quantities of Si.

There are a number of other elements which, when added to the iron-carbon alloys, have the effect of lowering the Ar_1 change point; the lower boundary of the austenitic condition. The effect of any lowering of this change point is to reduce the range of temperature between this point and the normal temperature during which the carbide and ferrite can separate out of the γ-iron solid solution austenite, and the γ-iron change to the α modification. The lowering of the Ar_1 change point for this reason makes it more easy to retain the austenitic condition, as slower rates of cooling are sufficient to inhibit these changes. The action of those added elements which tend to lower the Ar_1 change point is therefore in the same direction as that of quenching. In certain cases, with sufficient added elements, the Ar_1 point can be reduced to normal, or lower than normal, temperatures, and in these cases the alloys exist normally in the austenitic condition.

A number of elements and combinations of elements, when added to iron-carbon alloys in sufficient quantities, have the effect of preserving the austenitic condition at normal temperatures. Two examples of the commoner elements which have this effect are nickel and manganese, and the effect of simple additions of nickel or manganese can be illustrated by the type of diagram* utilised by Guillet. This type of diagram for the iron-carbon-manganese alloys is illustrated in Fig. 1, and shows the normal structure of these alloys. With over 13.5 per cent. manganese, in the absence of carbon, the alloys exist in the γ-iron, austenitic condition. As the carbon content increases, the amount of manganese required to preserve this austenitic condition decreases. Above a certain percentage of carbon, 1.65 per cent. in the diagram, the free carbide begins to make its appearance in the structure. The location of this point at 1.65 per cent. carbon by Guillet was purely arbitrary, and not necessarily correct; nor are the boundaries of the structural zones necessarily straight lines. These diagrams can be regarded only as purely approximate. A similar diagram for the iron-carbon-nickel alloys has been constructed. It is of general interest to note that, in the case of nickel, 29 per cent. of this element is required to obtain the austenitic condition in the absence of carbon. Approximately, therefore, 29 per cent. of nickel has the same effect as 13.5 per cent. of manganese, or, in other words, manganese is approximately 2.14 times more powerful than nickel in preserving the austenitic condition.

The general properties of the iron alloys in the austenitic condition are quite distinctive. The true austenitic alloys are generally non-magnetic or feebly magnetic, of medium strength and Brinell hardness. They generally possess a low elastic limit and high deformability. They are readily susceptible to work hardening, and in some of the commercial austenitic steels cold-rolling is deliberately resorted to, to raise the yield point. The austenitic alloys do not harden on quenching; on the contrary, they tend to soften. A feature of some importance in these alloys is their distinctly higher coefficient of expansion.

Some of the austenitic alloys have remarkable resistance to corrosion. In fact, some of the most important of the stainless steels available are within the category of austenitic steels. The quantitative values of these properties vary with the character of the austenitic alloys and the character of the added elements utilised to produce the austenitic condition. These properties are in many cases of very great industrial importance, and in the steel region of the iron-carbon alloys a wide variety of austenitic steels have been developed for industrial purposes. The study of the specific properties of the austenitic type of alloy constitutes one of the outstanding developments in modern ferrous metallurgy. Exactly as in the case of the lower-carbon members, the austenitic condition of the γ-iron solid solution can be preserved in the higher-carbon members of the iron-carbon alloys. Such alloys are classified as austenitic cast iron.

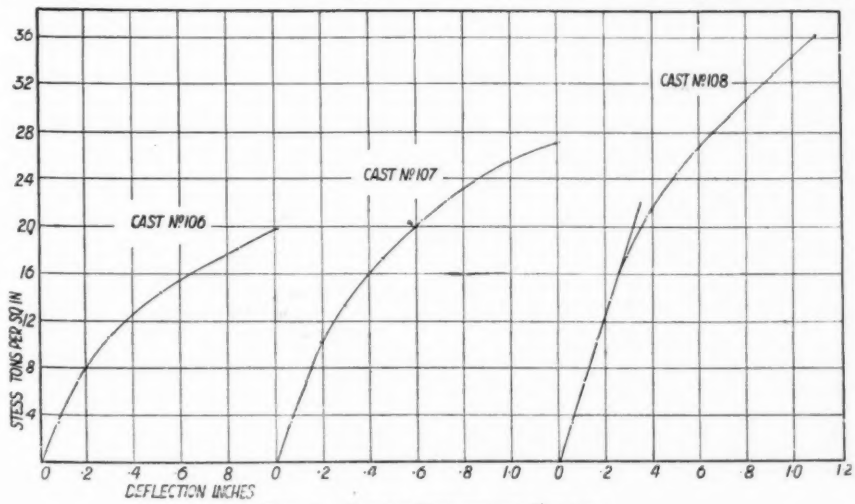


Fig. 3.—Stress-Deflection Curves.

As in the case of ordinary cast iron, the austenite is accompanied by the presence of graphite and, possibly, carbides. In commercial austenitic cast irons, the phosphorus constituents may be present also, depending upon the actual composition of the material. Naturally, the properties are modified by these extraneous constituents. It is of some interest to note that many of the properties of austenite, particularly the hardness strength, elastic properties and ductility, are not greatly influenced by the carbon content of the austenite. This is a factor of importance in austenitic cast iron. These irons are obtained by the addition of alloying elements to suitable base cast iron. The most common elements used for this purpose are nickel and manganese. The influence of nickel additions on the structure of a common type of cast iron containing 3.5 per cent. total carbon and varying quantities of silicon, is illustrated in Fig. 2. The lower boundary of the complete austenitic zone extends from approximately 12 to 16 per cent. nickel, with silicon contents from approximately 1 to 3.25 per cent. These plain nickel irons probably represent the simplest type of austenitic cast iron. Substantial variations in the properties of austenitic cast irons can be provided for by modifications in the composition. The addition of other elements which either enter into the solid solution or preserve the presence of free

* J.I.S.I., No. II, 1906.

carbides in the structure are suitable methods of bringing about such modifications. Similarly, the addition of other elements is sought after on the score of expense, with the object of reducing the amount of nickel required.

An example of the commercial application of austenitic cast iron is to be found in the range of non-magnetic cast irons developed by S. E. Dawson and Messrs. Ferranti (British Patent No. 204598). The essential feature of these irons is the presence of nickel and manganese. A typical composition contains 10 per cent. nickel and 5 per cent. manganese. Some nickel may be replaced by copper and the presence of aluminium is also recommended. A composition containing copper is as follows:—Nickel, 5 per cent.; copper, 5 per cent.; manganese, 5 per cent.; and aluminium, 1 per cent.

The majority of austenitic cast irons yield excellent castings by the centrifugal-casting process and, in fact, this process successfully overcomes the difficulties arising out of a higher shrinkage value of some of these cast irons. The following study of the mechanical properties of a range of special austenitic cast irons was carried out on specimens cast by the centrifugal process. The alloys in each case were melted in crucibles, and cylindrical drum castings similar to those used in the manufacture of renewable valve-seats were cast centrifugally, using metal moulds. The castings were approximately 8 in. long by 2 in. external diameter by $\frac{5}{8}$ in. radial thickness. All the castings were produced under carefully controlled conditions of casting temperature and die temperature. Four castings of varying chromium contents were selected for test purposes. The chemical analyses of these samples are recorded in Table I.

Table I.—*Composition of Alloys Used.*

Cast No.	Ni.	Cu.	Cr.	Si.	Mn.
106	15.25	6.95	1.36	1.03	0.58
107	15.13	7.00	2.75	—	—
108A	14.34	7.19	4.21	—	—
108B	—	—	7.72	—	—

The investigation of the strength properties was carried out on ring-form test-pieces in accordance with the manner laid down in B.E.S.A. Specification 5004 and B.E.S.A. Specification for aircraft material 4K6. Brinell-hardness determinations were made by means of a Firth hardometer, using the 1-mm. ball indenter. The mechanical test results obtained are set out in Table II.

Table II.—*Mechanical Strength of Centrifugally-Cast Alloy Irons.*

Cast No.	Tensile strength. Tons per sq. in.	Modulus of rupture. Tons per sq. in.	Permanent set value. Per cent.	En. value. Lbs. per sq. in. $\times 10^6$.	Stress value at which En. measured. Tons per sq. in.	Brinell hardness.
106 I	19.2	30.2	51.2	14.5	8.3	149
106 II	19.2	30.2	58.5*	13.6	8.2	149
107 I	25.0	40.0	24.2	19.2	11.5	212
107 II	27·25	43.7	—	19.0	11.1	212
108 AI	28.0	44.8	13.6	20.7	11.8	241
108 AII	—	—	—	21.0	12.6	241
108 BI	—	Too hard to	machine	—	—	418
108 BII	—	Too hard to	machine	—	—	418
Column ..	I	II	III	IV	V	VI

* At 19.2 tons per sq. in.

Tensile Strength.

The strength values given in Column I of Table II are calculated using the relationship laid down in the B.E.S.A. Specification 5004. As a more comparable figure, the modulus of rupture has been calculated and is given in Column II. This latter value is calculated from the relationship $f = \frac{P D}{748 b t^2}$ where:

f equals extreme fibre stress, tons per sq. in.
P equals load required to break ring in lbs.
D equals uncut external dia. of ring in ins.
b equals breadth of ring in ins.
t equals radial thickness of ring in ins.

This relationship omits the constant embodied in the B.E.S.A. Specification formula. The results show a high level of breaking strength and the substantial increase in this value accompanying the increase in chromium content.

Permanent Set Value.

This value has been calculated in the manner usually followed in the works method of testing piston-ring material. The gapped test-ring to the dimensions laid down in B.E.S.A. Specification is used. The residual change in gap after loading to the stress value of 14 tons per sq. in. as calculated by the B.E.S.A. relationship is measured. This value expressed as a percentage of the total change in gap at the above stress value is utilised as a comparative measure of the permanent set.

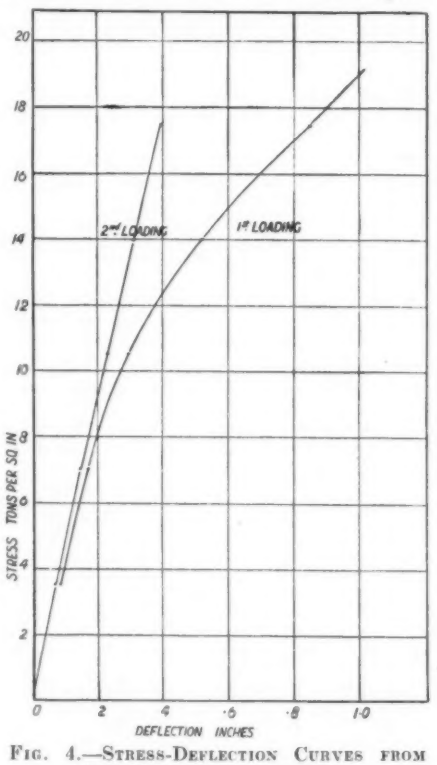


Fig. 4.—Stress-Deflection Curves from Two Successive Loadings.

The values for the low-chromium content samples No. 106 are extremely high, and the reduction in value accompanying the increase in chromium content is clearly shown. For comparison purposes it will be of interest to note that a mean value for cast-iron piston-ring material to B.E.S.A. Specification 5004 is about 10 per cent.

En. Value.

This nominal modulus of elasticity value has been determined strictly in accordance with the requirements of the specifications above mentioned. As will be shown later, for material of this character the comparative value of these results is open to some objection. The stress values at which these results have been determined, calculated by means of the B.E.S.A. formula, are given in Column V. The stress values vary quite appreciably. A further set of results determined from the stress-deflection curve data and calculated from the same relationship, but for a constant stress value of approximately 7 tons per sq. in., are as follow:—

Cast No. 106 ..	..	10.65×10^6 lb. per sq. in.
Cast No. 107 ..	..	14.6×10^6 " "
Cast No. 108 ..	..	18.15×10^6 " "

These are probably better results, but in both cases they show clearly the effect of increased chromium content in increasing the stiffness of the material. The lower stress value of 7 tons per sq. in. calculated in accordance with the B.E.S.A. formula has been selected in a purely arbitrary manner from an inspection of the stress-deflection curves. These curves disclose the fact that, at this lower stress value, conditions more closely approximating true proportionality exist. The determination of the En. value under the conditions laid down in the B.E.S.A. Specification is made under conditions of approximately constant strain. In the case of these austenitic cast irons these conditions involve stresses which are clearly outside the range approaching proportionality. The values obtained by both methods in the case of the low-chromium sample, Cast No. 106, are low as compared with a normal centrifugally-cast grey iron. This latter usually shows values ranging from 15 to 17.5 by 10^6 lbs. per sq. in.

Brinell Hardness.

The hardness determinations given in Column VI of Table II show very clearly the increments in hardness value accompanying the increase in chromium content. It is evident from these values that the hardness of this type of austenitic cast iron can be controlled largely by adjustment of this chromium content.

Stress-Deflection Curves.

Very interesting light is thrown on the behaviour of these samples under conditions of varying stress by an examination of the stress-deflection curves. These curves are similar in character to those used by the author in another connection.* The curves are drawn from data determined during the breaking of the ring-form test-pieces, and show the increment in gap opening of the stressed ring with gradual increment of stress. The curves obtained, illustrated in Fig 3, show clearly the difference in behaviour of the samples during loading. Cast No. 106, the low-chromium-content sample, gives a curve showing marked curvature commencing from quite low stress values. With increased chromium content the curves become straighter and steeper, indicating a closer approach to true proportionality and an increase in stiffness. The medium-chromium-content sample, Cast No. 107, still takes on appreciable permanent set at low stress values, but much less than in Cast No. 106. Cast No. 108, containing the higher chromium content, shows little tendency to take on permanent set up to a stress value of 14 tons per sq. in. From this point of view, this sample more clearly resembles a normal centrifugally-cast grey iron. The substantial deformation at all stress values, and particularly at stress values in the region of the breaking strength, confirms the knowledge of the ductility of austenitic materials, and it is of interest to note that this property still exists in austenitic cast irons. It is also clear that as the chromium is increased this property is very much depreciated.

The marked work-hardening effect possible in austenitic materials is demonstrated in these samples of austenitic cast irons by the curves illustrated in Fig. 4. The specimen used in the determination of these curves was taken from the sample Cast No. 106. The specimen was

* "Oil-Hardening and Air-Hardening Cast Iron," Foundry Trade Journal, December 4, 1930.

submitted to initial loading up to a stress value closely approaching the breaking stress as determined from a previous test on another sample of the same material. After this initial stressing, the load was removed and the sample submitted to a second loading. The stress-deflection curves resulting from these two successive loadings are shown in the figure. The curve from the first loading shows the characteristic curvature of this material commencing at low stress values. On loading a second time, the curve becomes almost a straight line, showing that the

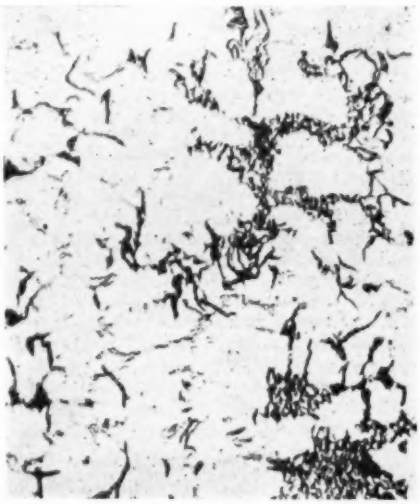


Fig. 5.—Austenitic Cast Iron, Cast No. 106. Etched HCl. × 200 dias. Cr Content 1.36 per cent.

deformability has almost disappeared and a condition of almost true proportionality has been obtained. It is also probable in this instance that the ultimate breaking stress has been lowered by the initial loading. In all the above stress-deflection determinations, the loading was applied slowly with regular increments at regular

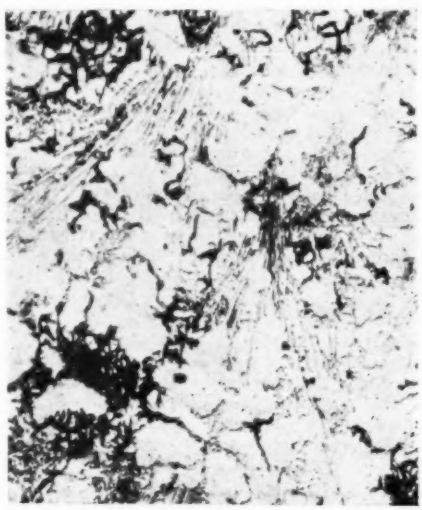


Fig. 6.—Cast No. 107. Etched HCl. × 200 dias. Cr Content 2.75 per cent.

intervals of 45 secs., the load remaining on the specimens for 30 secs. prior to measuring the gap.

Microstructure.

The photographs of etched specimens examined under the microscope are illustrated in Figs. 5, 6 and 7. The alloys show a ground-mass structure of austenite and graphite with increasing quantities of chromium carbide. It is evidently due to the presence of this free chromium-carbide in the structure that the properties are modified.

Heat-Treatment.

Further specimens from each of the separate casts were taken and heated to a temperature of 925 deg. C. in an electric-resistance furnace. One set of specimens was quenched in water from this temperature and the other allowed to cool down slowly with the furnace. The test results obtained after these treatments are set out in Table III.

Table III.—*Mechanical Strength after Heat-Treatment.*

Cast No.	Condition.	Tensile. Tons per sq. in.	Modulus of rupture. Tons per sq. in.	Permanent set. Per cent.	En. value. Lbs. per sq. in. × 10^6.	Brinell hardness.
106	Slow cooled	17.6	28.2	28.5	16.6	163
106	Quenched	19.4	31.0	38.8	15.2	163
107	Slow cooled	33.8	54.0	24.6	20.4	217
107	Quenched	33.8	54.0	22.6	17.8	217
108	Slow cooled	33.0	52.8	23.1	19.6	228
108	Quenched	41.0	65.6	19.6	20.6	241

The effect of both quenching and slow cooling from 925 deg. C. on the material represented by Cast No. 106 is not very marked. There is a slight hardening effect accompanied by a slight rise in En. value. The strength is not greatly affected and the permanent set value is considerably reduced.

The higher-chromium-content samples are more strongly affected by these heat-treatments. The

Fig. 7.—Cast No. 108. Etched HCl. × 200 dias. Cr Content 4.21 per cent.

slow-cooled samples cast numbers 107 and 108, show a marked increase in strength value. The hardness values and En. values are practically unchanged and in the highest-chromium-content

Table IV.—*Total Increment in Gap Openings at approximately Ultimate Breaking Load.*

	As cast.	Slow cooled.	Quenched.
	In.	In.	In.
Cast No. 106 ..	0.39	0.466	0.42
Cast No. 107 ..	1.112	1.216	1.73
Cast No. 108 ..	1.098	1.11	1.39

sample No. 108 the permanent set value is definitely increased. The quenched samples of the same cast numbers yield interesting results. The hardness values are unchanged. The strength value of cast No. 108 has undergone a substantial increase, whilst the En. value of cast No. 107 shows a slight decrease. Broadly, either type of heat-treatment on the higher-chromium-content samples may be said to improve the general strength properties. Quenching appears to increase quite distinctly the ductility of the samples, a fact which is illustrated further by a comparison of the total increment of gap opening (deflection) at approximately the breaking load. These figures are summarised in Table IV.

Summary.

The properties of a type of austenitic cast iron cast by the centrifugal process and containing varying quantities of chromium have been examined. With increasing quantities of chromium the material becomes harder; the ultimate strength and modulus of elasticity are increased. In a like manner, the stress at which substantial permanent set is taken up is increased and the magnitude of the permanent set is decreased with increasing chromium content. The effect of initial stress tends to increase the stiffness, raise the limit of proportionality and decrease the liability to subsequent permanent set and deformation. With up to 4.21 per cent. chromium, the strength properties of this material are satisfactory. With 7 per cent. chromium this iron becomes unmachinable. Heat-treatment, either by slow cooling or quenching, has very little effect on the Brinell hardness. The strength properties are generally improved, to a greater degree, in the higher chromium content. Quenching appears distinctly to increase the ductility of the higher-chromium content samples.

In addition to the above, the coefficient of expansion of cast No. 107 was determined as 1.89×10^{-6} for a temperature range of 650 deg. C. These alloys also possess good corrosion- and heat-resisting properties.

The writer wishes to take this opportunity of acknowledging his indebtedness for permission to publish these results to Messrs. Sheepbridge Stokes Centrifugal Castings Company, Limited, Chesterfield, in whose research laboratories the whole of the work has been conducted.

The Openshaw Junior Technical School, Manchester.

One of the earliest junior technical schools in the country, and one of the most successful, is that at Openshaw, Manchester. This school has recently moved into new premises, which were officially declared open on September 28. The various engineering laboratories and workshops are splendidly equipped, and much of the plant has been given by local firms. A noteworthy sign of the times is that a foundry has been provided, which is equipped with a cupola, crucible furnaces for non-ferrous work, a large pit for floor moulding, and a number of moulding and core-making benches. Up-to-date auxiliary plant is also included in the equipment.

For some years a successful class in foundry practice has been in operation in the old buildings; this class has now been reorganised and is making use of the new foundry. About forty students have been enrolled, and the class is in charge of Mr. E. Flower, Vice-President of the Lancashire Branch of the Institute of British Foundrymen. It is expected that some of the students will shortly be prepared to sit for the certificates in foundry practice recently arranged by the Institute of British Foundrymen and the City and Guilds of London Institute.

Recruiting Foundry Personnel.

The Newcastle and District Branch of the Institute of British Foundrymen held the first meeting of the session at the Neville Hall, Newcastle-upon-Tyne, when Mr. F. Allan presented his Presidential Address. Before giving his Address, Mr. Allan referred to the death during the year of Mr. F. Sanderson, late Branch-Secretary, and asked the members to show their respect for him by standing. The council had recommended the election of Mr. Elsdon, the late chairman of the Junior Section, to the council to fill the vacancy caused by the death of Mr. Sanderson. This recommendation was carried unanimously.

Mr. Allan also mentioned the forthcoming Convention to be held in Newcastle next year, from June 7 to 10. He asked all members to do their utmost to assist in making the Convention as successful as the last one held there. It would be difficult to attain that, taking into consideration the existing trade conditions.

Presidential Address.

Mr. Allan, in his Address, was particularly pessimistic as to the industrial condition on Tyneside, but envisaged a turning of the tide. He expressed his confidence in the ability of the British workmen to produce the highest grade of material. He appealed for the more extensive application of research investigations and the use of labour-aiding machinery. He hazarded a guess that, under boom conditions, there would be a shortage of moulders, despite the fact that mechanisation had eliminated most of the moulder's extraneous activities, such as sand preparation and casting of moulds. He expressed the opinion that the making of moulds would never be purely mechanical. The modern inducements offered to an entrant to the foundry industry were already attracting a better type of youth. The Address was closed with an appeal for the organisation of industry for the production of well-made articles at attractive prices. This could only be effected, said Mr. Allen, by the fullest application of the results of the research activities of the industry.

Foundry Classes for Apprentices.

A general discussion which followed the Address was opened by Mr. Colin Gresty, who, after complimenting Mr. Allan on his Address, said that there were one or two points which Mr. Allan had touched upon which he personally thought were of extreme importance. He had referred to the fact that when a boom in trade came there would be a shortage of skilled moulders. From his own experience he realised that that was going to be a serious difficulty. In the first few months of last year, when the works were fairly busy, they had had to import moulders from the Clyde district, and that was at a time when the foundries in the Tyneside district were not by any means full up with work. If they ever became as busy as they were in the past it would result in a serious position. He thought it was probably linked up with the question of foundry classes. With classes being given in the district it was hoped that it would be an additional incentive. It was, perhaps, a little difficult to say anything at the present time, but there was a slight disappointment in the attendance this year, although they had been very well attended last year. The Rutherford College authorities were anxious that everyone should do their best to get boys to join the classes. A fair amount of money had been expended on the classes by the College and also by certain interested firms in equipping the experimental foundry at Walker Gate, arrangements being on a four years' basis at least. They realised that a probable reason for the falling-off in the attendance was that the boys were not working. Any help which the members could give in that direction would be much appreciated, the same remarks applying undoubtedly to the Junior Section.

The balance of the discussion had reference to the apprenticeship question, but as wages and money considerations, price levels and politics entered into it very largely, we have had to eliminate the majority of the observations made.

Technical Education not Advocated.

Mr. N. Dickinson said that he had experienced considerable trouble with the apprentice question. Personally, he did not believe in educating apprentices; as soon as a boy got the idea that he could advance, he would not remain in the foundry. He had continually encountered cases where boys who had received some technical education left the foundry after about two years; they wanted to be in the fitting shop where they could see something when it was finished. Foundrymen never saw their work as finished articles. He thought the education that apprentices needed was an hour or two on two or three days a week, with the foreman or one of the more highly-skilled men who would tell them the reason why certain things were done. They would make better craftsmen that way.

Mr. W. Scott disagreed with Mr. Dickinson as to the education of apprentices. He thought that if apprentices were sent to an ordinary school, putting the question of technical education to one side, they would be better craftsmen because they would learn how to think. If they could get some technical education, all the better.

Mr. Smith said that he thought there had been plenty of good moulders in the last fifty or sixty years who had had no technical education. He thought that if there was work they would be able to get the boys.

Mr. Scott said that he thought the whole point was being mixed. Of what good would these men be when they were competing against modern methods such as were current in France and Germany? They were probably good moulders through having fifty years' experience, but they could not wait until then before they were able to do a job. When he engaged apprentices he tried to employ the sons of men who were working in the shop. The boy gave better attention to his work when his father was working in the vicinity, and although it might seem a little unfair, it had the desired effect.

Mr. J. W. Frier stated that he was inclined to agree with Mr. Dickinson. To train apprentices, they should be trained in the foundry, with a certain amount of technical knowledge. The moulders who had been in the foundry for the last forty years or so had had no technical education and yet they were the men who had built up the reputation of the foundry trade.

Sound Elementary Grounding Essential.

Mr. J. Scott said that the subject of technical education for apprentices bristled with difficulties, and easily led to misapprehension. Mr. Dickinson had made the statement relative to education for foundry apprentices that they were really better moulders in a sense without education, but the speaker took him to mean that they were better without higher education. Mr. Scott thought that to give technical education to a boy who had not had a good grounding in ordinary elemental education was futile. To his mind the scarcity of apprentices was very largely due to the fact that the foundry was such an unattractive place. The average education received by a boy up to the age of 14 was quite ample to fit him for the foundry if he could only be induced to enter it. If a boy took an interest in the trade then was the time to get him to take more advanced studies. With regard to Mr. Smith's reference to the old moulders not being men of education, the education that they had had was not the same as the education which boys received nowadays. He was bound to say that in his experience boys 50 years ago received a better grounding in the old board school than they did now in the elementary school up to the age of 14. At 12 years old, in the board school, they were taught subjects which were never touched in the elementary school to-day, and were taught only in the secondary schools. Very possibly the men Mr. Smith referred to had, perhaps, as good if not a better education than the average boy who left school to-day.

Mr. Allan appreciated that boys required to have a good grounding, but he still maintained that education as they understood it, both elementary and technical, was essential if the apprentices were to be of the type of craftsmen who were wanted. They were approaching a point where everything was more or less scientifically controlled, and the more a boy could learn of the technical side of the business the better chance he would have of understanding what was required of him.

Mr. Smith said that once he had that knowledge the boy would not remain a moulder.

Mr. Scott asked why a certain group of youths should be condemned to stop their education when they reached a certain standard. He did not think anyone could be over-educated.

Mr. Dickinson said that he had not been running down education. He believed everybody should get as much as he could, but he had been referring to the foundry trade. It was his opinion that they would never get educated boys to enter the foundry.

Effect of Educational Hiatus.

Mr. Frier was not of the belief in sending a boy to foundry classes as soon as he commenced his apprenticeship. If it were found that he was taking an interest in his work, then was the time to send him to technical classes.

Mr. Gresty disagreed entirely with Mr. Frier's statement. He said that was the one thing they were fighting against, because once a boy entered the foundry they could not induce him to attend classes. They almost had to learn their alphabet again before they could take advantage of the classes. When the scheme was first started, the education authorities for the first year allowed them to accept any boy, but after that time they could only permit those boys who had not had a two years' break to enter. When they left school they had to go to the ordinary evening classes, and they had then attained a standard which fitted them to take the technical classes. If they had a break they lost the habit of going to school, and it was very difficult to do anything with them.

Mr. Allan said that they had looked at the question from all angles, and he thought that the surest way of getting any results from what had been said during the discussion was to endeavour to induce the boys to reach the ordinary elementary standard. He still believed that boys in the foundry needed technical education as much as the boys in the engineering trade in order to benefit the industry in the future.

Mr. Gresty, in proposing a vote of thanks to Mr. Allan, said that the discussion was evidence of the great interest they had had in the Address. Mr. Logan seconded the vote of thanks, which was passed unanimously.

Applications for Trade Marks.

The following list of applications to register trade marks is taken from the "Trade Marks Journal":

"Alakron."—Metal castings. William Mills, Limited, Grove Street, Birmingham.

"Cah."—Pig-iron. Lander & Larsson, Limited, 164, Edmund Street, Birmingham.

"Peaksil."—Silica bricks. The Derbyshire Silica Fire Brick Company, Limited, Friden Station, Hartington, near Buxton.

"Monobeta."—Non-ferrous metals. Billington & Newton, Limited, Vulcan Foundry, Station Street, Longport, Stoke-on-Trent.

Moulding Practice for Heat-Treated Aluminium-Alloy Castings.*

By Lewis H. Fawcett.†

Copper-bearing aluminium alloys present difficulties in moulding, due to the relatively high crystallisation shrinkage and hot-shortness of such alloys. Therefore, special methods or precautions must be employed in the manufacture of castings made of this class of material in order to overcome the effect of these characteristics. On the contrary, an alloy consisting of approximately 95 per cent. aluminium and 5 per cent. silicon has excellent casting characteristics. Unfortunately, however, the latter composition is relatively deficient in both strength and ductility as compared with a heat-treated aluminium-copper alloy containing 4.5 per cent. copper. It is the purpose of this Paper to outline the methods and precautions that are necessary in the satisfactory production of castings composed of aluminium with from 4 to 5 per cent. copper.

Design of Casting and Pattern.

As far as practical, castings should be designed of uniform cross-section, avoiding abrupt changes from one cross-section to another. Liberal fillets should be employed, round openings are preferred to rectangular ones and rounded corners also are to be desired. Frequently, patterns that are completely satisfactory for silicon-aluminium alloys are entirely unsuitable for the heat-treated alloy. When practical, patterns should be designed to permit the casting to contract away from the cores instead of towards the core.

Self-coring patterns for interiors, where practical, are preferable to box cores. For large work, the pattern may be designed for use of loam cores in lieu of box cores. Patterns must be so designed that heavy sections will be accessible for the required shrink heads. The use of loose pieces, causing excessive overhang of mould which must be heavily secured, are to be avoided. It also is essential that patterns be accurate to permit the assembly of cores without causing excessive finning on the completed castings.

Venting, Chills, Flasks and Sand Control.

The general principles underlying the moulding of aluminium-alloy castings apply in the main to the heat-treated alloy, but special precautions must be taken to obtain full success. In green-sand work adequate venting is important, sand control is desirable, moulds should be rammed lightly and uniformly and sand worked with slightly less moisture content than is customary in the case of other non-ferrous metals. Flasks should not be "barred" any closer than necessary to secure the mould, in order not to obstruct full contraction. Chills are essential in large sections inaccessible to shrink heads. Brackets or tie bars often are required to prevent cracking of the castings.

Cores.

Special attention should be given to cores for the heat-treated alloy. Cores must be soft and capable of being crushed as the metal contracts around them, so as not to crack the metal as it cools through the hot-short range of temperature. This may be accomplished by the use of collapsible cores, that is, cores that are strong enough to withstand handling and pouring but capable of collapsing after pouring, so as to prevent cracking the casting. It is essential that care be taken in selecting sand binders so as to obtain a binder that will disintegrate at low temperatures. Heavy core rods should be avoided. Liberal use of cinders or crushed coke in the interior of cores is desirable. It is far better to have occasional breakage of cores in handling than to have cores so strong that they cause breakage of the castings.

Gating.

It is essential that serious thought be given to gating. The longer the flow of metal from the gate before meeting an obstruction, the cleaner the castings. As a general rule, gates should be designed so that the sprues enter the smaller cross-section rather than the larger cross-section of the casting. By this means the hot metal will be cooled by passing through long, thin sections before it reaches the larger section, resulting in a more uniform grain size throughout the casting. Also, improperly placed gates may restrict contraction by acting as a clamp and causing the casting to crack during cooling. Before increasing the pouring temperature to run a casting, study should be made to determine if the gates could be improved.

Shrink Heads.

More liberal use of shrink heads is necessary with this alloy than is the case with the silicon-aluminium alloy. Round heads are more efficient than rectangular ones. An increase in the height of a head often is more conducive to results than increasing its diameter. In general, however, an increase in the pouring height is not to be recommended, but the desired results may be obtained by building the shrink heads or risers above the cope, pouring the casting, covering the gate with a weight and then filling the excess head with hot metal. Overflowing of heads during pouring should be avoided, as the fin produced in this manner may restrict contraction and cause the casting to crack or check.

Pouring Temperature Control.

The greater the care taken in melting, to prevent excessive temperature and to avoid foreign material coming in contact with the charge, the more consistent will be the results obtained. Pouring temperature also is of great importance. A general rule that can safely be followed is to pour at the lowest possible temperature that will run the casting. Accurate control of pouring temperature should be employed for two reasons:—(1) low temperatures decrease contraction during solidification, and (2) likewise increase the mechanical properties of the material. At the Naval Gun Factory, the metal is placed in carborundum or clay-graphite crucibles and melted in anthracite-coal-fired, pit-type furnaces. When the temperature of the metal reaches 705 deg. C., the crucible is withdrawn from the furnace and poured immediately into the moulds, the work being scheduled so that the mould and metal are ready at the same time. In this manner the pouring temperature for the average size work is maintained at from 705 to about 675 deg. C.

Fluxing and Pouring.

Before pouring, the metal should be fluxed with zinc chloride (1 oz. per 100 lbs. of metal) and carefully skimmed. Sprues should be kept choked during pouring and the metal handled quietly without agitation to prevent oxidation and to keep the castings free from dross. The ideal condition to minimise agitation is an unbroken stream poured from a low height.

Alloys.

The best results are obtained when the alloy is compounded with the purest grades of commercial aluminium and copper. Minor constituents must be reduced to the lowest possible extent, for the presence of even small percentages of other elements may cause a great reduction in ductility after heat treating. It also is advisable to make an alloy of 50 per cent. copper and 50 per cent. aluminium to be used as a "hardener." A representative melt would consist of the hardener with the necessary aluminium addition, plus 40 per cent. scrap resulting from a former melt of like composition.

Shaking-Out and Fettling.

In the case of intricate work, often it is desirable to remove the casting from the mould as soon as it can be handled, and to "knock-out" the cores to allow ease of contraction. Although great care must be taken at this stage to prevent distortion, nevertheless it is considered that the benefits obtained in reducing the chances for checking fully justify the effort required in careful handling. The above-mentioned precautions are extremely important, due to the previously mentioned hot-short characteristics of this composition. Changes in dimensions of the castings after being removed from the sand are not great. Distortion in moulding is not appreciable, provided the above-stated preventive measures are diligently performed. Heads and gates are removed by sawing. The remaining bottom portions of heads then are ground to the level of the surrounding surface. If any fins are present, they are removed by grinding. After this operation the castings are ready for heat-treatment.

Heat-Treatment Equipment.

The equipment used by the Naval Gun Factory for heat-treating aluminium-alloy castings consists of an electric-resistance furnace, about 6 ft. in dia. and 9 ft. deep, a quenching tank of the same capacity, and the necessary auxiliary devices. Both the furnace and tank are beneath the floor level and within a few inches of each other. The furnace top, which is only a few inches above the foundry floor, is removed by means of an electric motor. It is lifted slightly and moved sideways to open or close, and when closed it is sand sealed.

Heat is obtained from chrome-nickel grids located on the bottom and around the circumference of furnace, the furnace being maintained at plus or minus 1.5 deg. C. of the desired temperature by means of automatic temperature-control apparatus. The temperature control is aided by the fact that the furnace is entirely surrounded by heat-insulating material. Temperature of the water may also be elevated by passing steam through the perforated coils placed on the bottom of the quenching tank. During the heat-treating operations the castings are contained in steel-framed wire baskets. All of the baskets have the same diameter, about 4½ ft., but differ in height. The large size occupies the entire furnace depth, the medium size one-half of the furnace, and the small size one-third of the furnace capacity. Baskets are handled by a jib crane with a 1-ton electric hoist attached.

Distortion.

Heat-treatment is accompanied by excessive distortion unless the proper care is exercised in securing the castings during the heating period. Castings are heated to 515 deg. C. and held at this temperature for from 18 to 24 hours, depending on their cross-sectional areas. Thus, the heat-treating temperature approaches the melting point of the material, with the result that the castings become soft and will bend and distort unless they are properly supported. To prevent change in dimensions, when the castings are placed in the baskets they are well secured with wire and by wedges placed beneath them, so that they remain in a vertical position.

Heating Castings.

The castings also are set in a vertical position on account of the type of furnace being used, namely, an air-sealed furnace in which the heating units are located around the circumference

* From a Paper read before the American Foundrymen's Association.

† Metallurgist, U.S. Naval Gun Factory, Navy Yard, Washington.

and on the bottom, without any artificial means of circulating this heat. Consequently, the heat is transmitted to the castings by radiation, and, therefore, the castings should be so placed in the baskets that the maximum surface area is exposed to the direct heat rays emanating from the grids.

Quenching.

It is essential that the time between withdrawing the casting from the furnace and its subsequent quenching be as short as possible, otherwise the desired mechanical properties cannot be obtained. The equipment, being designed for the purpose, is so efficient that this interval of time is only one-half minute. After quenching, the basket is allowed to remain in the water until the castings have been reduced in temperature to that of the quenching water. The water generally is maintained at a temperature between 65 and 85 deg. C. On being withdrawn from the tank, the castings dry almost immediately, due to their temperature being approximately 35 deg. C. higher than the temperature of the plant. As this is the last stage of the process, the castings are dispatched to the machine shop when removed from the baskets.

Ageing.

Although heat-treatment is necessary to produce the desired mechanical properties on standing at room temperature after being heat-treated, this alloy will increase in tensile strength and decrease in ductility. This change in properties is called ageing. A noticeable amount of ageing will take place within a few days after the heat-treatment of the material. On this account the specifications require that test-bars representing castings made from this copper-aluminium alloy shall age at least 48 hrs. before being tested. Therefore the test-bars are machined at any time within the 48 hrs., but are not pulled until the expiration of that period of time.

Specifications.

Requirements governing the testing of this material are found in Navy Department Specifications, Aluminium Alloy, Light; Castings, 46 Ala, Class 4. The chemical analyses of two representative melts are given in Table I, and the mechanical properties of several typical cases are shown in Table II. The low content of minor constituents, as given in Table I, is a great factor in obtaining the high elongations shown in Table II. This excess of ductility over the requirements is intended as a margin of safety to counteract the possibility of further decreases in elongation by future ageing.

Table I.—*Composition.*

Designation.	Al.	Cu.	Si.	Zn.	Fe.	Mg.	Mn.
Requirements of 46Ala, Cl4	94.5 min.*	4.0-5.0	1.20 max.	0.25 max.	1.20 max.	0.35 max.	Trace max.
Melt No. 7233R	95.12	4.48	0.21	—	0.19	—	0.05†
Melt No. 7463R	94.98	4.73	0.13	—	0.16	Trace	0.05†

* Total of all constituents, other than Cu and Al, 2.5 per cent. maximum. † Less than.

Table II.—*Mechanical Properties (Dia. of Specimen, in inches:—as cast, 0.565; after machining, 0.505).*

Designation.	Pouring temp. Deg. C.	Tensile strength. Tons per sq. in.	Elongation in 2 in. Per cent.	Fracture.
Requirements of 46Ala,Cl4	—	12.5	6.0	—
Melt No.—				
7233R ..	675	16.2	12.5	Irregular.
7463R ..	665	16.7	17.6	..
8686R ..	705	13.1	10.0	..
8710R ..	680	15.6	13.2	..
7558R ..	665	14.7	8.5	..
7576R ..	690	15.6	16.2	..
7636R ..	690	13.8	8.7	Irregular (flaw).
7753R ..	675	14.5	10.2	Irregular.

Catalogue Received.

Pneumatic Tools.—We have received from Sir W. G. Armstrong, Whitworth & Company (Engineers), Limited, Scotswood Works, Newcastle-upon-Tyne, a file copy of a catalogue covering in 20 separate sections an exceptionally complete range of pneumatic tools. Of these, founders, unless possessing boiler and other shops, should ask to be furnished with sections 1, 4, 10, 16a, 17, 18 and 18a. We are wondering whether our experience with pneumatic tools in the foundry really represents the truth, or whether it is pure coincidental, but in brief it is this: A decade ago, whenever we visited foundries, we found the use of pneumatic rammers fairly well established. We remember that certain moulders would express themselves very forcibly if ever a colleague helped himself to his particular pet tool. Then, curiously enough, they seemed to go out of fashion, and we heard doleful stories of their inefficiency, high cost of upkeep, moulders did not like them, and so on. In recent months there has been a resuscitation of interest, and now there is a wave of buying once more. We hope the issuing house will forgive this dissertation, but fashions do exist in foundry practice, and we believe that pneumatic tools are once more in vogue. For instance, the very latest jar-ram moulding machines are provided with a counter-balanced pneumatic rammer for flat-ramming after jarring. After 30 years' of specialising and possessing modern foundries, Armstrong, Whitworth should certainly be in a unique position for meeting sympathetically and intelligently the needs of British foundries. We propose reviewing only the sections of direct interest to the foundry industry. Section 1 tells of the interchangeability of the parts incorporated; an after-sales service, conducted from a fleet of service vans; and spare parts. Then it concludes with a series of practical instructions for the use and maintenance of the tools. Section 4 describes and illustrates a range of chippers, and we are sure that if the instructions detailed on page 10 are carried out a minimum of trouble will be experienced. Section 10 outlines the potentialities of three standard sizes of sand rammers, designed for different duties, No. 163 being for bench moulding and core making, and 165 and 167 for heavy and light floor work. Blow guns for replacing bellows or ordinary air hose are also listed and described. Section 16a covers the provision of light-weight drills (No. 16 having dealt with the heavier variety) and grinding and polishing machines, whilst Section 17 describes a heavier type of grinder very suitable for the fettling shop. The last two sections are devoted to hose couplings and accessories and to hose-coupling pliers. Unquestionably this collection represents a veritable text-book on pneumatic tools, and few recipients will do other than preserve it carefully for reference purposes.

Owing to the alteration in the exchange position the Minister for Customs at Wellington, N.Z., has decided that the value in New Zealand of all goods invoiced in any currency other than that in force in New Zealand is to be assessed for Customs duties according to the rate of exchange in force at the date of export from the country from which the goods were shipped.

A Difficult Core Simplified.

By Thomas Davis.

The modern tendency in pattern design for the efficient production of castings is towards making moulding simpler and core making more difficult. Should this continue a future can be visualised when core making will become the predominant branch of the art. Much work now expected of the core department would be almost too difficult to make without the assistance of oil-sand. An instance in this respect is shown in Fig. 1. The sketch is slightly exaggerated for the sake of clarity, but an underlying principle is indicated. It will be seen that the "neck" of this core is such as to make it a most difficult task to position and secure sufficient wires to carry the top thin section A. The result is that when the box is drawn, this thin section begins to droop and break away. The problem was solved by making the core in oil-sand, and adopting the following simple method. A separate core is first made in oil-sand from that part of the box forming the thin section A, using

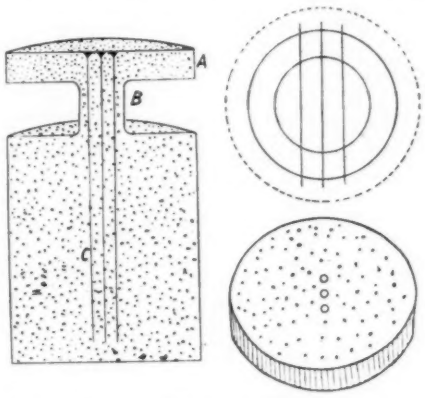


Fig. 1 (left).—Section of Core.
Fig. 2 (top right).—Core Wires for Section A.
Fig. 3 (bottom right).—Top of Section A.

wires for support, as shown in Fig. 2. While this part core is green, three holes are made near the centre (Fig. 3), coming directly over the "neck" shown at B, Fig. 1. When the top section is dry, it is dressed off and replaced in its original position in the core box, covered with a core plate, and the core box turned over. Both the neck and the body of the core are now rammed up, a second plate placed on the box, and turned back, lifting the box and contents with the bottom plate The position of the core is now such as seen in Fig. 1. The holes previously made in the top section are now filled with oil-sand, and through each of these a wire is inserted extending to within an inch of the bottom of the core, as at C. These wires act in a dual capacity: (1) They secure the top thin section A to the "neck" of the core B; (2) they form the only other binders necessary for the core. The box can now be drawn with comparative freedom, since the top section, being dry, there is no fear of it drooping or breaking away. Once the thin section is dried and replaced in the box, the core can be made within three minutes.

A message from Johannesburg states that the South African Manganese Corporation announces that, in view of the fact that all manganese quotations are in British sterling, the present world crisis has made all buyers of manganese cautious in placing new orders, and, pending the clearing-up of the international exchange position, and more particularly the South African exchange, delivery orders on current contracts are being withheld. As the Corporation has stocks on hand to meet any urgent orders, it has decided to stop production until the position is clearer.

The Strength of Cast Iron in Relation to Thickness.

In recent years the strength of cast iron in relation to the diameter of the test-bar has been investigated by many workers, particularly in England and America. A definite relationship, however, could not be established. In a recent Paper, P. A. Heller has resumed this problem, using the experimental data available in literature.* Only those Papers were considered which permit the laws of the great numbers to be applied.

In Fig. 1 the curves representing the experimental series considered are shown; the authorities and the composition of the irons are also given, the constituents being recorded in the order C, Si, Mn. All the curves show the same course, but differ in slope to the abscissa. From the strength values are plotted in a half-logarithmic scale, several curves change into straight lines. This seems to indicate that the relation between strength and thickness is represented by a logarithmic law of the nature x = a log. y + b, where x is the strength and y the thickness.

The conclusion drawn from Fig. 1 is confirmed by plotting the irons in the Maurer diagram (Fig. 2). Here, too, two distinct groups result, the irons belonging to the upper field standing on the left of the graph, those belonging to the

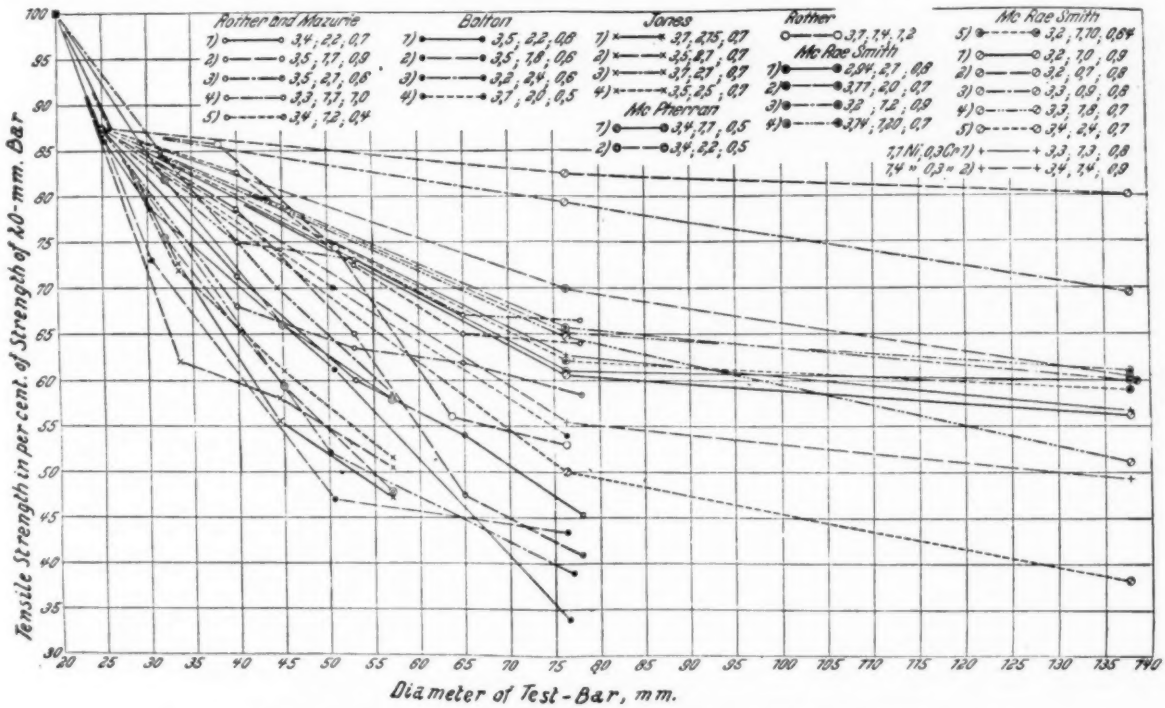


Fig. 1.—Variation of Tensile Strength with Diameter of Bar for Various Irons.

give full particulars with regard to the experimental conditions.

The tensile strength of the 20-mm. test-bar was taken as 100, and the strength of the larger diameters computed in percentage thereof. For the conversion of the series, starting from a diameter of 25.4 mm. (1 in.), it was found by experiments that an increase in diameter from 20 to 25.4 mm. is associated with a fall in strength of 12.5 per cent. With one series the strength for the 20-mm. bar was graphically determined. The method used is somewhat simple, but the only one which is practicable, as the experimental data are not sufficient to this it can be concluded that, with a given iron, the fall in strength with increasing wall-thickness is independent of the absolute strength of the thinnest cross-section. Further, it can be seen that, within the group of curves considered, two distinct fields can be discerned without difficulty, the line of demarcation being perhaps the curve McRae Smith No. 4 (second series). All the curves which lie above this line have a high position; that is, the tendency of the irons represented by them to become weaker with increasing wall-thickness is smaller than that of the irons in the lower field. With a greater number of experimental data it would perhaps be possible to locate also a central field. When lower field on the right (the underlined points refer to curves in the central position). The irons considered are of standard composition, with the exception of two Lanz Perlit irons (McRae Smith, second series, Nos. 2 and 3), which, however, agree well on account of their normal structure. It remains to examine whether the strength-thickness relation is influenced by the other constituents of the iron, or by heat-treatment in the solid or liquid state.

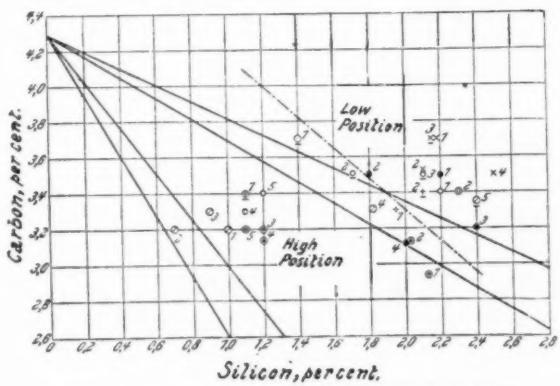


Fig. 2.—Position of Irons shown in Fig. 1 in the Maurer Diagram.

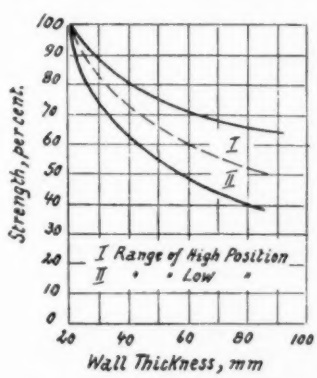


Fig. 3.—Strength-Thickness Relation.

With more comprehensive data it must be possible, with the aid of the method mentioned above or the laws of the great numbers, to design a graph from which the tensile strength of a given cast iron can be read for any thickness. Such a graph, incomplete indeed, is illustrated in Fig. 3. This graph shows that an iron which has a strength of 24 kg. per sq. mm. with a wall-thickness of 20 mm. and, on account of its position in the Maurer diagram, has a strength-thickness curve lying in the upper field, will show 65 to 51 per cent. of this strength with a thickness of 80 mm.; that is, 15.6 to 12.2 kg. per sq. mm. which, relative to the average value of 13.9, corresponds to a factor of safety of ± 1.7 kg. per sq. mm. It is obvious that such a graph would be of great value for the engineer who, because of the reliable data given by it, would be enabled to use cast iron as a constructing material to a greater extent.

Similar investigations were also made with respect to the transverse strength of cast iron, but, because of the wide discrepancy in the test results, a clear idea of the strength-thickness relation could not be formed.

* "Die Giesserei," 1931, vol. 18, pages 237-241.

Founding Throughout the Ages.

A successful opening meeting of the Sheffield Section of the Institute of British Foundrymen was held at the King's Head Hotel, Sheffield, on October 2, when a large attendance of members enjoyed the Presidential Address of Mr. G. C. Castle. The business meeting was followed by a smoking concert.

Before commencing his address, the newly-elected chairman thanked the members for doing him the honour of electing him President for the coming session. It was customary in a Presidential Address to indicate the change of membership since the opening meeting of the previous session, and he was happy to state that the additional members numbered 1 subscribing firm, 8 members, 17 associate members and 1 associate.

Local Educational Facilities.

Founders in Sheffield appreciated the valued work in science undertaken by the University, and the steady and persistent work already accomplished by many foundrymen in this district, especially in the lecture courses provided by the Science Department of the University, would be a valuable asset to those who desired to go further into the studies and secure the national certificates. The City and Guilds of London Institute examinations now placed foundry practice and patternmaking on a national basis.

During the present condition of trade it was surely a good plan to keep up to date in technical knowledge and in touch with developments taking place, especially when the information could be obtained in such a helpful and convenient form. Members of the industry who were adversely affected by working short time or under suspension would be admitted to the lectures without payment of the fee.

The lectures were held in the evenings (7.30 to 9.30 p.m.), the first hour being usually taken up by the lecture and the second with questions and discussion. The lectures were supplemented by demonstrations in the University laboratories and workshops. At the conclusion of the course, visits to works of interest would be made by kind permission of local and other works.

Early Days of Iron Smelting.

Mr. Castle then delivered his address. "Founding Throughout the Ages," was, he said, a very wide subject, and one which could not be dealt with to the fullest extent in a Presidential Address, but it was hoped to give some interesting data. One of the greatest triumphs of modern times was the blast furnace, which was capable of producing hundreds of tons of molten iron a day. The iron produced varied in properties and composition according to the material charged into the furnace, and these materials consisted of ores or metallic oxides contaminated with foreign matter which was found existing in varying proportions in the resultant product. The constituents of pig-iron were iron, carbon, silicon, manganese, sulphur and phosphorus, with occasionally small quantities of other elements which might have been purposely or accidentally added in the furnace, or which might be contained in the ores or one of the ingredients used.

The discovery of iron was unknown to-day, but probably its first known form was meteoric iron. Ancient man was not long in finding that iron could be hammered and forged when heated, and this knowledge provided the elementary principles of smelting methods. It could not be said that the process was worked simultaneously in varying parts of the known ancient world, but from the knowledge that could be gained there was a marked similarity in the methods adopted. In Britain there was evidence that the Celts on the Cheviot Hills (prior to the Roman invasion) carried on some means of melting or smelting which was markedly similar to that carried on by the African natives along the banks of the Zambesi River.

In the early days of the Egyptian dynasty, the Egyptians imported a large part of their iron from Ethiopia, and the methods of iron smelting depicted by them were similar to those employed to-day in Abyssinia. From the very earliest times the people of Assyria produced appreciable quantities of iron, whilst some of the early Indian tribes also practised the art of iron smelting and working.

Abundant evidence of this elementary progress in early days showed that man had learnt the value of iron and appreciated it—so much so that it was regarded as a precious metal. Admittedly, development was slow in the actual smelting operations, but good progress was made in the art of manipulating the iron, and it was not long before the ancients found that steel could be produced by heating the iron in contact with carbon. Iron produced by these early methods was practically pure, and, in general, of a remarkable quality. The heat required to melt it was, however, so intense that the casting of iron was not possible, and the smith reigned supreme and practised his art with wonderful skill.

There is one particular object of interest to all iron founders and iron and steel workers, namely the famous Delhi pillar. Iron had been used and worked for thousands of years, and was well known in India long before the Christian Era. The outstanding monument to the work of the early Indians was this Delhi pillar, which, in all probability, was made previous to the year 400 B.C.; thus its estimated age is something like 2,350 years. Its weight is estimated at approximately 6½ tons, and it is about 60 ft. long, including the portion below ground.

The Middle Ages were responsible for some very wonderful castings in bronze and precious metals, but not so in the case of iron. An approximation of the melting points of wrought iron, steel and cast iron at this stage form an interesting comparison: Wrought iron (0.01 per cent. carbon), 1,500 deg. C.; steel (1.5 per cent. carbon), 1,420 deg. C.; cast iron (3.75 per cent. carbon), 1,150 deg. C.

This, of course, explained to a great extent why the smiths predominated in those days, and also why iron castings were unknown. Increase of carbon content from 0.01 to 3.75 per cent. reduced the fusion point by 350 deg. C.—about 75 deg. C. higher than the melting point of copper.

The Great Bell of Moscow.

Among non-ferrous castings of outstanding size, and often of extreme antiquity, bells had frequently figured prominently. There were numerous very large bells in China, Burma and elsewhere in the East, and Russia formerly possessed many bells considerably above average weight. The giant of Russia's bells was the Great Bell of Moscow, the famous Tsar Kolokol or "King of Bells." This bell was cast in 1733 (or 1734), during the reign of the Empress Anne, by Michael Motovine, a Russian bell founder, and was made partly from the metal of an earlier bell cast in 1654; the original one weighed nearly 130 tons (by repute), a further 72,000 lbs. of metal being added. As the weight of the Tsar Kolokol was generally given as 193 tons, obviously the true weight was not known, and as was the case with other foreign bells of large size, it was probably merely an approximation. Its principal dimensions were: height, a little over 19 ft.; dia., 22½ ft.; thickness at sound bow, 23 in. For a century this monster bell was lying in the ground with a large portion of 11 tons weight broken out of it. It was raised in 1836 by a Mr. Montferrand, and (if it had not during the last few years been broken up) rested upon a pedestal. In any case, its use as a bell was almost impossible, but one would like to know more about the melting of the metal and the moulding for such a casting, made almost two hundred years ago. The metal was analysed at the time of the raising and consisted of:—Copper, 84.51; tin, 13.21; sulphur, 1.25, and loss, 1.03 per cent. The loss was attributed to zinc and arsenic, of which traces were recognised.

In the famous city of Pompeii, a few miles south of Naples, lying under the shadow of Vesuvius, there are many specimens in the Museum of ancient iron and bronze work, some of them being remarkable, and the alchemists of those days must have been very capable men to carry out such work. One might also mention specimens of metallurgical and laboratory utensils which were also in the Museum.

Another interesting and comparatively recent product of founding was the typewriter. In the modern typewriter there were one thousand parts, and castings of every description were utilised in making up the finished machine. During a recent visit, through the courtesy of Dr. Olivetti, to the Olivetti works in Ivrea, Italy, it was possible to see the lay-out of a modern typewriter foundry. The foundry used very small moulding boxes, and rows of these boxes lay on the floor. The melting was done in a continuous-type of cupola, using a high-phosphorus pig-iron in order to ensure fluidity, and 7 to 10 tons of iron were used per week for making typewriter castings.

In modern iron-foundry work, the use of various alloys, such as nickel, chromium and vanadium, was common, and the latest development of all was an alloy containing silicon, manganese and aluminium.

Ornamental Castings.

The casting of metals and other materials into various forms required for certain purposes—whether of an economical or ornamental character—is a subject of paramount interest. It might be classed as the noblest of the arts, serving as it did with unvaried interest the fine as well as the useful arts. The minute, well-finished castings of iron and bronze were evidence of human skill and ingenuity. It was interesting to note that Great Britain was not behind modern times in making ornamental castings and sculpture work, and there were in this country foundries capable of producing such castings without equal, a recent one of which was 9 ft. 3 in. high and weighed 30 cwts. The process used was that termed *cire-perdue*.

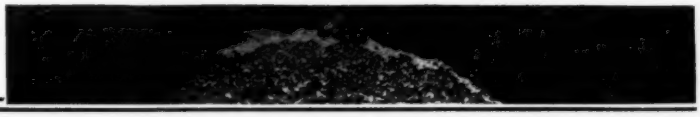
Foundrywork, Mr. Castle concluded, whatever grade it might come under, was the basis of the engineering and allied industries. It has been constantly noted that the principals of works having a foundry department did not take the same interest in it as they did in the engineering shops, and it was up to such owners to take as much interest in the foundry department as any other. There they would see the consummate skill that is employed from day to day in the casting of metals, and might sometimes sympathise with the artisans who were responsible.

Contracts Open.

Christchurch, N.Z., November 12.—Pumping equipment, for the Christchurch City Council. The Department of Overseas Trade. (Reference G.X. 10,774.)

Tantah, Egypt, December 2.—Complete electric power station, for the Ministry of the Interior. The Department of Overseas Trade.

Wellington, N.Z., December 18.—Armoured cable and cable boxes, for the New Zealand Government Railways. The Department of Overseas Trade. (Reference A.X. 11,122.)



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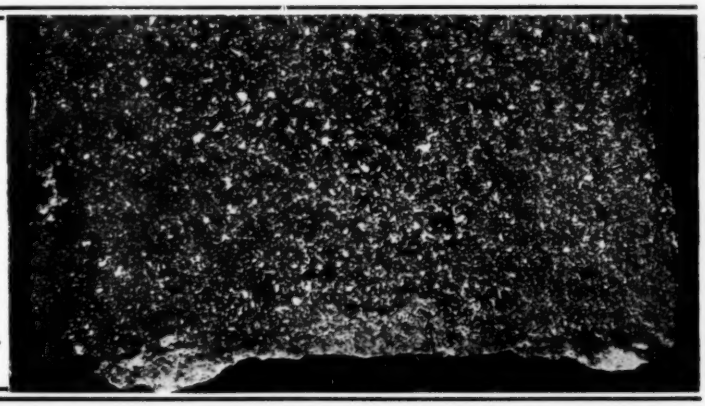

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MANCHESTER, BIRMINGHAM, NEWCASTLE, COLOMBO.

TRADE SIROCCO MARK

This Week's News in Brief.

Trade Talk.

The production in August of steel castings in France was 18,000 tons.

Workman, Clark (1928), Limited, Belfast, have booked an order for a vessel of approximately 5,000 tons for the Standard Fruits Steamship Company, of New Orleans.

The British (Guest Keen Baldwins) Iron & Steel Company, Limited, has reopened an intermediate-size mill at its Dowlais steelworks. The sleeper mill is also now in operation.

The Metal Box Company, Limited, which already holds 303,790 ordinary shares of £1 out of 350,000 in the British Can Company, Limited, has made an offer to acquire the remaining 46,210 shares.

The War Office has ordered a considerable number of six-wheeled vehicles from the Albion Motor Car Company, Limited, Glasgow, of the same type as those already supplied to the Indian Government.

The South African Iron & Steel Industrial Corporation, Limited, has invited the public to subscribe for a debenture issue. The South African Public Debt Commissioners are applying for £1,000,000, leaving £500,000 for the public.

Messrs. Crane-Bennett, Limited, have moved the whole of their office organisation, including sales, shipping, accounting department, etc., to their new building at 120, Pall Mall, London, S.W.1. They are retaining their warehouses at 45, Leman Street, London, E.1.

The South Wales Siemens Steel Association is understood to have under consideration a rebate scheme the essence of which will be to give a rebate off the price of Welsh bars to those sheet and tinplate makers who purchase the whole of their requirements from members of the association.

The Tata Iron & Steel Company, of India, has acquired from the Keystone Steel Company, in the United States, that company's patent rights for manufacturing rust-resisting copper-steel products, principally plates, sheets and shapes. The steel contains from 0.25 to 1 per cent. copper.

The memory of the late Mr. Andrew Laing and his activities in the cause of the advancement of the sciences of engineering and shipbuilding are to be perpetuated by an annual memorial lecture to be given under the auspices of the North-East Coast Institution of Engineers and Shipbuilders.

Hollings & Guest, Limited, engineers, have removed their works from Thimble Mill Lane to Cardigan Works, Belmont Row, Birmingham. Mr. G. N. Guest, managing director of the firm, is also managing director of John Hands & Sons, Limited, also of Belmont Row, Birmingham, and it has been decided to combine the two businesses.

The imports of foreign iron ore at the Prince of Wales Dock, Workington, in the third quarter of the year amounted to 25,840 tons, compared with 26,750 tons in the previous three months and 39,750 tons in the third quarter of last year. The imports of ore in September were 16,040 tons, against 9,800 tons in August and 19,600 tons in September, 1930.

The West of Scotland Association of Foremen Engineers and Draftsmen have arranged an interesting programme for the session which opened last Saturday, when Mr. Matthew Russell, the newly-elected President, delivered an address. Mr. Russell is foreman patternmaker with Drysdale & Company, Limited, Yoker, and is a member of Council of the Scottish Branch of the Institute of British Foundrymen.

D. & W. Henderson, Limited, have secured a contract to build, at their Meadowside yard, Glasgow, a vessel of 6,500 tons for H. Hogarth & Sons, Limited, Glasgow. It is stated that, although the vessel was not required at the moment, and remunerative work was unlikely to be waiting for the ship on completion, it was hoped that it would be needed later for the expected trade revival. The contract was placed solely for the purpose of assisting in the reduction of unemployment amongst shipyard workers.

The Birmingham Metallurgical Society's opening meeting of the session was held at the Chamber of Commerce on October 6, when the awards for students' Papers were given to Mr. A. A. Timmins, who wrote on "Progress in the Development of the Corrosion-Resisting Steels," and Mr. H. F. Allwood, whose Paper was entitled "The Separation of Aluminium and Magnesium." The presidential address of Mr. W. F. Brazener dealt with the functions of the works metallurgist. It was probable, he said, that the position to-day was a development from the old works analyst. About 60 years ago it became the practice in many metal works to have materials analysed. The advantages were so obvious that the works analyst became an established factor in the routine of the metal works. That was a primary step to technical control. In a way, it gave the metal manufacturer a first taste of scientific methods. No matter how efficient the salesmanship might be, without quality the turnover would diminish; no matter how glaringly the advertisements stood out, without quality trade would slacken; and no matter how protective a trade ring, without quality a works was doomed to extinction.

The annual conference of the British Works Management Association was held in London on Friday, October 2, Mr. G. Hurford (chairman of the Association and director of manufacture, Standard Telephones & Cables, Limited) presiding. Mr. Frank Hodges (director, Securities' Management Trust, Limited, and member of the Central Electricity Board), speaking on "Works Management in Relation to Rationalisation," said that industrial efficiency was the goal of rationalisation, and fundamentally the standard of life of the British people rested on it. Mr. E. J. Fox (president of the British Works Management Association and managing director, the Stanton Ironworks Company, Limited) said that the whole secret of efficient management of production was attention to details, not the least of which was the establishment of co-operation on the part of all concerned. Mr. G. E. Rowland (chairman, Agricultural & General Engineers, Limited), speaking on "Factors in Successful Mechanisation," said that the intensive use of machines—mechanisation—had been and always would be unpopular, as it inevitably meant at first a displacement of labour. Mechanisation, to be successful, must lower costs while at the same time raising wages and profits. It would thus improve the standard of living. Not only had wages been increased during the period of mechanisation, but hours of work had been reduced.

Company Meeting.

R. & W. Hawthorn, Leslie & Company, Limited.—Consideration of a proposal to repay to shareholders 10s. per share was postponed, on the recommendation of the directors, at an extraordinary general meeting of Messrs. R. & W. Hawthorn, Leslie & Company, Limited, which followed the annual general meeting on September 24. The chairman, Mr. Charles E. Straker, announced that the directors were of opinion that the developments in the national financial situation made it desirable to defer the operation. It was, therefore, unanimously agreed to adjourn the extraordinary meeting until November 16. The directors' report and accounts were unanimously adopted, and the payment of a dividend of 5 per cent. was confirmed.

Obituary.

Mr. James Swinney, a director of Messrs. Swinney Bros., Limited, Wansbeck Ironworks, Morpeth, died recently.

Mr. Harry Maze Jenks, of Messrs. J. & H. M. Jenks, iron, steel and black-plate merchants, Wolverhampton, died on October 8.

Mr. L. J. Pardon, technical representative of the Standard Piston Ring & Engineering Company, Limited, Sheffield, died at Walsall on Monday, October 5, as the result of a motor accident. Mr. Pardon, who was 38 years of age, was well known in engineering and shipping circles.

Personal.

Mr. Joseph Ward, of Messrs. Thos. W. Ward, Limited, was installed Master of the Company of Cutlers in Hallamshire last week, the ceremony taking place at the Court House, Sheffield. The outgoing Master Cutler is Mr. P. B. Brown, of Messrs. Hadfields, Limited.

Mr. Albert Cutts has retired from the position of manager of the West Foundry at the East Hecla Works of Messrs. Hadfields, Limited, Sheffield, after having been in the service of the firm for 35 years. Mr. Cutts was the recipient of presentations from the directors and staff at a gathering in Sheffield recently.

Mr. C. J. Hyde Trutch, who is head of the Diesel-electric traction department of Messrs. Sir W. G. Armstrong, Whitworth & Company, Limited, has been awarded the railway engineering gold medal by the Council of the Institute of Transport for his Paper "The Oil Engine and the Railways." The medal is presented by the Railway Companies' Association.

Mr. A. N. McQuistan has been appointed to the position of director and general manager of the Furness group of undertakings, including the South Durham Steel & Iron Company, Limited, the Cargo Fleet Iron Company, Limited, and Messrs. Cochrane & Company, Limited. Prior to going to Tees-side eleven years ago, Mr. McQuistan played an important part in the iron and steel industry in Scotland, and during the war period he was responsible for carrying out many intensive munitions programmes.

Wills.

Cranston, J. G., engineer, of Messrs. Charles Martin & Company, Limited, Gateshead	£17,453
Clinker, R. C., chief research engineer for the British Thomson-Houston Company, Limited, Rugby	£11,414
Barton, C. W., of Sheffield, for 40 years works manager of Messrs. Henry Bessemer & Company's steelworks	£5,564
Aston, G. B., of Wolverhampton, formerly a manager of the Ettingshall works of Messrs. Joseph Sankey & Sons, Limited	£4,097

Publications Received.

Merseyside Employments — Commercial Occupations.—The Liverpool Education Committee has sent us a beautifully-produced booklet, running to nearly 100 pages, which has as its object the guidance of teachers, parents, social workers and guardians as to the future careers of the local youth. It is the fourth of the series to be issued, we are told; we feel, however, that at the present juncture it is a type of service which might be suspended without causing undue harm. It is, in fact, typical of an economy well worth while at the present time.

"Armstrong-Whitworth Record."—The first issue of the "Armstrong-Whitworth Record" to come to our notice is Vol. 1, No. 4, and we regret that the previous numbers have not come into our hands, as the one under review is as interesting reading as any popular science journal—a type of publication it strongly resembles. One article is from the pen of Mr. James Bell, of Close Foundry, Gateshead, and deals with a trip made by himself and his colleagues to France and Belgium with the fixed purpose of visiting foreign foundry establishments—an effort well worth emulating by other large corporations. The great feature of this publication is the well-balanced interest it maintains between material purely of interest internally and to the general public. Now that we have seen this issue, we shall look forward with a good deal of pleasure to its regular receipt—a feeling which will be shared by those of our readers who will be similarly favoured.

THE TRUTH

Gold, the Country's financial life-blood, has been drained for years, to maintain the pound in France at the ridiculously artificial level of five times its pre-war value, and in Belgium at seven times, to the detriment of the industrial classes of Great Britain.

In the meantime, French and Belgian Sands and Steel Castings have flowed unchecked into Great Britain, whilst British workers have lived on the dole.

The movement of sterling having become too powerful for the continued restraint of those who have controlled it so long, it has burst its banks and found its own normal and proper level.

This means that French and Belgian goods sold here hitherto at artificially low figures must be increased in price by 20% to 25%.

THE PRICE OF OUR SANDS HAS NOT BEEN INCREASED

We are, moreover, prepared to contract for twelve months ahead.

USERS OF FOREIGN SANDS

are invited to 'phone or wire us at once with a view to discussing with one of our principals an arrangement for the supply of *"all-British"* Sands at prices which will show them a saving both in first cost and in the cost of sand per ton of output.

THE PRIME MINISTER HAS MADE IT CLEAR THAT PATRIOTISM IMPERATIVELY CALLS FOR THE PURCHASE OF BRITISH GOODS ONLY

"Every ounce of foreign sand brought into this country is another blow at the Nation's heart."

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Raw Material Markets.

The situation in the iron and steel markets is clouded by the financial position and the uncertain prospects of the impending General Election. The makers are receiving a large number of inquiries, but the majority are only to test the market, and the amount of business being done has fallen off somewhat. Export business is restricted to a certain extent by exchange uncertainties, but is broadening out owing to the lower value of sterling in foreign countries.

Pig-Iron.

MIDDLESBROUGH.—Cleveland ironmasters are booking an increasing number of orders. There has been a great improvement in the local demand, partly due to the desire of the foundries to renew their depleted stocks before there is any rise in prices, while good sales of Cleveland iron have been made to Scottish consumers during the last few weeks. Makers' stocks have been reduced by a considerable amount, and, although there has so far been no change in prices, a rise seems inevitable, as costs of production are now, in some cases, much increased. Prices remain at the minimum level. No. 1 Cleveland foundry iron is quoted at 61s. per ton, No. 3 Cleveland G.M.B. at 58s. 6d., No. 4 foundry at 57s. 6d., and No. 4 forge at 57s. per ton.

There is still a brisk demand on the East Coast hematite market in spite of the increased prices, the majority of the sales being to the Midlands. Contracts both for immediate and forward delivery are now being arranged. In the West Coast market feeling is still uncertain, and the position is difficult to analyse. Larger purchases are being made by consumers, and the producers talk of putting more furnaces into action to cope with the increased demand, one having been already blown in this week.

LANCASHIRE.—There has been a slight reaction in the Lancashire market, owing to the fact that most of the foundries covered their needs during the recent spate of buying. A quieter time is expected until deliveries against contract are required, although the possibility of an advance in prices is a disturbing factor. In the meantime values are unchanged from last week. For delivery to users in the Manchester price zone, Staffordshire, Derbyshire and North-East Coast brands of No. 3 iron remain at 67s. per ton, with Northamptonshire foundry iron at 65s. 6d., Derbyshire forge at 62s., Scottish No. 3 at about 87s. and West Coast hematite iron at about 81s. per ton.

MIDLANDS.—The market has eased off somewhat, the majority of consumers having already covered their requirements. There has been no change in quotations. For delivery to Birmingham and Black Country stations makers continue to quote 62s. 6d. for Northants No. 3 and 66s. for Derbyshire, North Staffordshire and Lincolnshire No. 3.

SCOTLAND.—The demand is larger than it has been for some time, but there are signs of a reaction. The price of Cleveland No. 3 iron in this market has been increased by 5s. to 62s. 6d. per ton, f.o.t. Grangemouth. Northamptonshire iron is now at 60s., f.o.t. Grangemouth. Continental iron is in a difficult position, the question of what currency payments are to be made in being much disputed. A price of 58s. per ton is tentatively advanced, f.o.t. Grangemouth. The export position is still poor. No. 3 foundry remains at 69s. 6d. per ton, f.o.t. furnaces.

Coke.

The Midlands market remains dull, and there are no signs of any immediate improvement. In the Cleveland district the position has shown a decided improvement, and prices are increasing. In this area 16s. per ton, delivered works, has been paid for furnace qualities, and even higher sums are demanded for the best grades.

Steel.

The situation in the finished steel market shows little real improvement. A greater volume of inquiries has been received, but few orders have materialised. The General Election is, for the moment, acting as a check upon business. The home mills are receiving more orders for semis, as a result of the difficulty of transacting business with the Continental producers, who are hanging back until the exchange rates become more settled.

Scrap.

On the Cleveland scrap-iron market, merchants are transacting more business, although there has been no alteration in quotations. Founders are buying up heavy cast iron at 40s. per ton. Good machinery quality remains at 42s. The Midlands market is in a difficult position. Consumers are willing to contract forward at present prices, but merchants are convinced that values will shortly rise, and are only releasing small parcels. There have been some slight price increases. Heavy cast-iron machinery scrap is now at 47s. 6d., while light cast-iron scrap remains at 37s. 6d. The South Wales market remains inactive, consumers being, for the most part, very non-committal. In Scotland the demand has improved slightly, but the steelworks are still short of work for the future. Machinery cast-iron scrap has risen to 47s. 6d. to 50s. and ordinary cast iron to 42s. 6d. per ton.

Metals.

Copper.—The American market is still overshadowed by the presence of large stocks, but at the moment the position is a little stronger. Irresponsible offers are less numerous, and the Incorporated Exporters maintain their quotation of 7.50 cents per lb. c.i.f. Europe. The position of copper in the home market remains unsatisfactory. Messrs. Henry Gardner & Company, Limited, in their report, say that "very little electro copper has changed hands at the official price; indeed, at the present rate of consumption, there appear to be ample supplies of copper from sources other than America to supply the needs of manufacture."

Closing quotations :—

Cash.—Thursday, £34 8s. 9d. to £34 10s.; Friday, £34 7s. 6d. to £34 10s.; Monday, £34 15s. to £34 17s. 6d.; Tuesday, £35 15s. to £35 17s. 6d.; Wednesday, £35 10s. to £35 12s. 6d.

Three Months.—Thursday, £35 8s. 9d. to £35 11s. 3d.; Friday, £35 8s. 9d. to £35 10s.; Monday, £35 15s. to £36 17s. 6d.; Tuesday, £36 15s. to £36 15s. 3d.; Wednesday, £36 6s. 3d. to £36 7s. 6d.

Tin.—The market for tin is largely influenced by speculators, and there is little buying for consumption. The consumer, in general, is waiting to see the effect of the General Election before coming out on to the market.

Official closing prices :—

Cash.—Thursday, £125 to £125 5s.; Friday, £127 10s. to £128; Monday, £129 to £129 10s.; Tuesday, £130 5s. to £130 7s. 6d.; Wednesday, £130 15s. to £131.

Three Months.—Thursday, £129 2s. 6d. to £129 5s.; Friday, £129 15s. to £130; Monday, £131 5s. to £131 10s.; Tuesday, £132 5s. to £132 10s.; Wednesday, £132 15s. to £132 17s. 6d.

Spelter.—The demand for spelter has slackened slightly, although the galvanisers are still evincing a certain amount of interest. The competitive power of the British industries using spelter is now much improved, and it is hoped that there will be a like improvement in the consumption of the raw material.

Daily fluctuations :—

Ordinary.—Thursday, £12 7s. 6d.; Friday, £12 13s. 9d.; Monday, £12 17s. 6d.; Tuesday, £13; Wednesday, £12 16s. 3d.

Lead.—The position of lead remains satisfactory, prices being comparatively stable. There has been a slight reaction in the demand, owing to the recent heavy purchases, but a fair amount of business is still being transacted. Present supplies seem sufficient for consumers' needs.

The week's prices have been :—

Soft Foreign (Prompt).—Thursday, £12 15s.; Friday, £12 18s. 9d.; Monday, £13 5s.; Tuesday, £13 10s.; Wednesday, £13 7s. 6d.

Notes from I.B.F. Branches.

Burnley Section of the Lancashire Branch.—The session opened on October 10 at the Technical School, Accrington, when Mr. F. J. Cook, M.I.Mech.E., read a Paper on "High-Duty Irons for Steam-Engine, Diesel-Engine and Compressor Cylinders." This was illustrated by lantern slides, and outlined the methods of producing and testing material suitable for the three types of cylinders. The discussion was opened by Mr. J. Jackson, and Mr. R. W. Stubbs proposed a vote of thanks to Mr. Cook. Mr. R. W. Kenyon, who seconded the proposal, said that he was unable to attend the meetings owing to ill-health, but on the present occasion he took the risk in order that he might see and listen to his friend, Mr. Cook; they were both very old members of the Institute. He was satisfied to note the continued growth of the Institute, and emphasised its value to all engaged in the foundry industry.

Mr. Makemson, secretary of the Institute, then outlined the scope and aims of the Institute, and stressed the need for increased membership.

Book Review.

Metallographer's Handbook of Etching. Compiled by Torkel Berglund (translated from the Swedish by W. H. Dearden, M.Sc., A.I.C.). Published by Sir Isaac Pitman & Sons, Limited, London. 1931. ix plus 183 pages. Price 12s. 6d. net.

Any doubts as to whether the subject of etching and etching methods as used in metallography is sufficiently broad to warrant special treatment in a single volume are set at rest immediately on consulting the extensive bibliography included in this book. There are at least four hundred references to remind us how scattered are the details of this technique, throughout a range of technical papers and publications. This is by no means the greatest of the difficulties confronting those searching for detailed information on this subject. Generally, this type of information is embodied as quite a small section in the presentation of the results of metallurgical investigations, the title of which gives no clue to the searcher that the investigation is likely to contain the information sought for. There can be no hesitation in saying that a book of this kind will prove of great value to every metallurgist and metallurgical student. From the foreword by Dr. Benedikt we are informed that the initiative for the compilation of this volume is due to the Society of Swedish Metallographers, who made the necessary arrangements for the work to be completed. The manuscript has been scrutinised by various members of the council and also Mr. C. Phragmen, the Secretary of this Society, a fact which is an additional recommendation that the subject has been authoritatively dealt with.

A most important and interesting section of the early chapters deals with the chemistry of etching, in addition to the general considerations underlying the various etching methods known. Macro-etching of iron and steel occupies forty-two pages of Chapter III, and a slightly longer chapter follows, entitled Micro-etching of Iron and Steel. The fifth, and last, chapter devotes approximately forty pages to the subject of etching of non-ferrous metals. This is followed by the excellent bibliography and the exhaustive index.

Mr. Dearden has performed a valuable service to the English-speaking metallurgists in translating this work. The translation is excellent. Messrs. Pitman have included the book in their specialists series, the standard of which gains definitely by this association. Nothing appears to have been omitted to make the work an up-to-date and authoritative treatment of the subject and an excellent book.

J. E. H.

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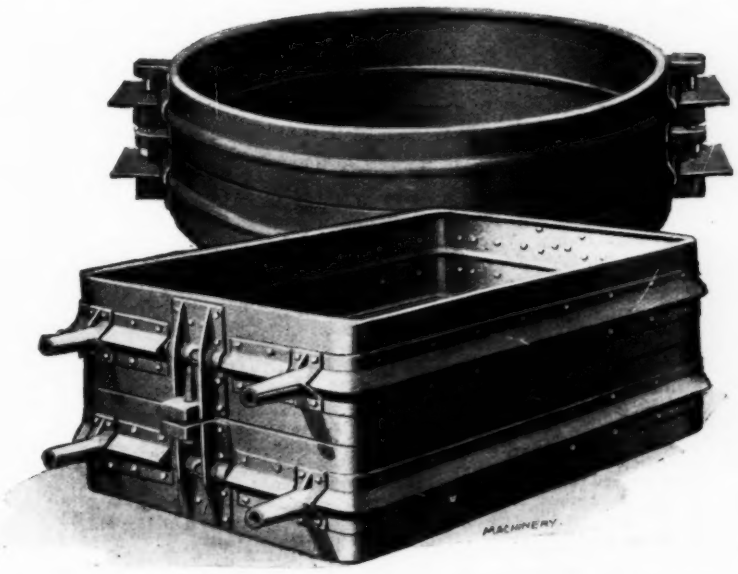
¶ We have the requisite up-to-date plant and equipment for manufacturing moulding boxes on the most economical lines.

CONSULT US

IF STERLING BOXES CANNOT HELP YOU WE WILL TELL YOU SO



STERLING FOUNDRY SPECIALTIES LTD.

London Office :
13, VICTORIA STREET, S.W.1.

BEDFORD

Telephone: 3345 BEDFORD.
Telegrams: "STERFLASK, BEDFORD."
Code: WESTERN UNION.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	35	10	0
Three months	36	6	3
Electrolytic	41	10	0
Tough	38	0	0
Best selected	38	10	0
Sheets	75	0	0
India	49	0	0
Wire bars	42	10	0
Do., November	42	10	0
Do., December	42	10	0
Ingot bars	42	10	0
H.C. wire rods	45	0	0
Off. av. cash, Sept.	31	11	1 3/4
Do., 3 mths., Sept.	32	9	1 1/4
Do., Sttlmnt., Sept.	31	11	1 1/4
Do., Electro, Sept.	36	12	1 1/2
Do., B.S., Sept.	33	10	10
Do., wire bars, Sept.	37	1	4 1/4
Solid drawn tubes			10 1/2d.
Brazed tubes			10 1/2d.
Wire			7 1/2d.

BRASS.

Solid drawn tubes	9 1/2d.
Brazed tubes	11 1/2d.
Rods, drawn	8 1/2d.
Rods, extd. or rlld.	5 1/2d.
Sheets to 10 w.g.	8 1/2d.
Wire	8 1/2d.
Rolled metal	7 1/2d.
Yellow metal rods	5 1/2d.
Do. 4 × 4 Squares	6d.
Do. 4 × 3 Sheets	6d.

TIN.

	£	s.	d.
Standard cash	130	15	0
Three months	132	15	0
English	132	5	0
Bars	133	15	0
Straits	134	5	0
Australian	132	5	0
Eastern	135	5	0
Banca (nom.)	145	5	0
Off. av. cash, Sept.	117	17	10 1/4
Do., 3 mths., Sept.	120	15	8 1/2
Do., Sttlmt., Sept.	117	17	6

SPELTER.

	£	s.	d.
Ordinary	12	16	3
Remelted	12	15	0
Hard	9	15	0
Electro 99.9	15	15	0
English	13	12	6
India	11	15	0
Zinc dust	23	0	0
Zinc ashes	3	15	0
Off. aver., Sept.	11	16	4 1/4
Aver. spot, Sept.	11	11	5 1/2

LEAD.

	£	s.	d.
Soft foreign ppt.	13	7	6
English	15	0	0
Off. average, Sept.	11	19	6 3/4
Average spot, Sept.	11	18	7 1/4

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	23	0	0
Do., V.M. ex-whf.	24	10	0
Rods	30	0	0
Boiler plates			—
Battery plates			—

ANTIMONY.

	£	s.	d.
Special brand, Eng.	40	0	0
Chinese	25	10	0
Crude	19	0	0

QUICKSILVER.

Quicksilver (nom.) .. $80

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—
25% .. 7 0 0 to 8 0 0
45/50% .. 10 0 0 to 12 0 0
75% .. 16 0 0 to 17 0 0

Ferro-vanadium—
35/50% .. .. .. 12/8 lb Va.

Ferro-molybdenum—
70/75% c. free 4/2 lb. Mo. plus 20%

Ferro-titanium—
23/25% carbon-free 9½d. to 10½d. lb.

Ferro-phosphorus, 20/25% ..
£17 0 0 to 19 0 0

Ferro-tungsten—
80/85% .. ..1/8½ lb. plus 20%

Tungsten metal powder—
98/99% .. 1/11½ lb. plus 20%

Ferro-chrome—
2/4% car. £33 0 0
4/6% car. £25 0 0
6/8% car. £24 0 0
8/10% car. £22 10 0

Ferro-chrome—
Max. 2% car. £36 10 0
Max. 1% car. £39 17 6
Max. 0·70% car. £41 0 0
70% carbon-free .. .. 11d. lb.

Nickel—99% £215 0 0 to £220 0 0

Ferro-cobalt .. .. .. 8/9 lb.

Aluminium 98/99% £95 0 0

Metallic chromium—
96/98% .. .. .. 2/9 lb.

Ferro-manganese (net)—
76/80% loose £10 15 0 to £11 5 0
76/80% packed £11 15 0 to £12 5 0
76/80% export (nom.) £ 9 0 0

Metallic manganese—
94/96% carbon-free .. 1/6 lb.
Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten 2s. 0d.
Finished bars, 18% tungsten 2s. 9d.
Per lb. net, d/d buyers' works.

Extras—
Rounds and squares, 3 in. and over .. .. 4d. lb.
Rounds and squares, under ½ in. to ¼ in. .. .. 3d. lb.
Do., under ¼ in. to 3/16 in. .. 1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ¾ in. .. .. 3d. lb.
Do., under ½ in. × ¼ in. .. 1/- lb.
Bevels of approved sizes and sections .. .. 6d. lb.
Bars cut to length, 10% extra.

SCRAP.

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel				2	2	6
Bundled steel and shrngs.	1	16	0 to	2	2	0
Mixed iron and steel				1	15	0
Heavy cast iron	2	2	6 to	2	5	0
Good machinery for foundries	2	7	6 to	2	10	0
Cleveland—						
Heavy steel				1	17	6
Steel turnings				1	5	0
Cast-iron borings				1	2	0
Heavy forge				2	7	6
W.I. piling scrap				2	0	0
Cast-iron scrap	2	0	0 to	2	2	0
Midlands—						
Light cast-iron scrap				1	16	6
Heavy wrought				2	1	6
Steel turnings, f.o.r.				0	17	0
Scotland—						
Heavy steel				1	17	6
Ordinary cast iron				2	2	6
Engineers' turnings				1	3	0
Cast-iron borings				1	10	0
Wrought-iron piling				2	2	6
Heavy machinery				2	7	6

London—Merchants' buying prices delivered yard.

Copper (clean)	28	0	0
Brass	20	0	0
Lead (less usual draft)	11	5	0
Tea lead	8	0	0
Zinc	6	0	0
New aluminium cuttings	60	0	0
Braziery copper	26	0	0
Gunmetal	23	10	0
Hollow pewter	80	0	0
Shaped black pewter	58	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—
Foundry No. 1 .. .. 61/-
Foundry No. 3 .. .. 58/6
Foundry No. 4 .. .. 57/6
Forge No. 4 .. .. 57/-
Hematite No. 1 .. .. 65/6
Hematite M/Nos. 65/-

N.W. Coast—
Hem. M/Nos. d/d Glas. .. 74/6
„ d/d Birm. 85/6
Malleable iron d/d Birm. 115/-

Midlands—
Staffs common* .. .. —
„ No. 4 forge* .. 61/-
„ No. 3 fdry.* .. 66/-
Shrops basic .. .. —
„ Cold blast, ord. .. —
„ „ roll iron .. —
Northants forge* 57/6
„ fdry. No. 3* .. 62/6
„ fdry. No. 1* .. 65/6
Derbyshire forge* 61/-
„ fdry. No. 3* .. 66/-
„ fdry. No. 1* .. 69/-
„ basic* .. .. —
*d/d Black Country dist.

Scotland—
Foundry No. 1 .. .. 72/-
„ No. 3 .. .. 69/6
Hem. M/Nos. d/d 68/6

Sheffield (d/d district)—
Derby forge 58/6
„ fdry. No. 3 .. .. 63/6
Lincs forge .. .. —
„ fdry. No. 3 .. .. 63/6
E.C. hematite 77/6
W.C. hematite 83/6

Lancashire (d/d eq. Man.)—
Derby forge 62/-
„ fdry. No. 3 .. 67/-
Staffs fdry. No. 3 .. .. 67/-
Northants fdry. No. 3 .. 65/6
Cleveland fdry. No. 3 .. 67/-
Dalzell, No. 3 (special) 102/6 to 105/-
Glengarnock, No. 3 .. 87/-
Clyde, No. 3 .. 87/-
Monkland, No. 3 .. 87/-
Summerlee, No. 3 .. 87/-
Eglinton, No. 3 .. 87/-
Gartsherrie, No. 3 .. 87/-
Shotts, No. 3 .. 87/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	9	15	0 to	10	5	0
Nut and bolt iron	8	5	0 to	8	10	0
Hoops				—		
Marked bars (Staffs) f.o.t.				12	0	0
Gas strip				—		
Bolts and nuts, ¾ in. × 4 in.				—		
Steel—						
Plates, ship, etc.	8	15	0 to	8	17	6
Boiler plts.	8	15	0 to	9	15	0
Chequer plts.				10	7	6
Angles				8	7	6
Tees				9	7	6
Joists				8	15	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ¾ in. (Untested)			6 15 0	& up.		
Flats—8 in. wide and over				8	12	6
„ under 8 in. and over 5 in.				8	17	6
Rails, heavy	8	5	0 to	8	10	0
Fishplates				12	0	0
Hoops (Staffs)				—		
Black sheets, 24g.	8	5	0 to	9	0	0
Galv. cor. shts.	9	15	0 to	10	0	0
Galv. flat sheets	10	5	0 to	10	10	0
Galv. fencing wire, 8g. plain				—		
Billets, soft	5	5	0 to	5	12	6
Billets, hard				6	12	6
Sheet bars	5	0	0 to	5	5	0
Tin bars				5	0	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	11½d.
Sheet to 10 w.g.	12½d.
Wire	12½d.
Rods	12½d.
Tubes	1/7d.
Castings	12½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
3/- to 10 g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	16.26
No. 2 foundry, Valley	17.00
No. 2 foundry, Birm.	12.00
Basic	17.26
Bessemer	18.76
Malleable	18.76
Grey forge	18.26
Ferro-mang. 80%	85.00
O.-h. rails, h'y, at mill	43.00
Billets	29.00
Sheet bars	29.00
Wire rods	35.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.60
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.60
Skelp, sheared steel	1.60
Steel hoops	1.80
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	2.90
Wire nails	1.90
Plain wire	2.20
Barbed wire, galv.	2.60
Tinplates, 100-lb. box	$4.75

COKE (at ovens).

Welsh foundry	25/- to 27/6
„ furnace	14/6 to 16/-
Durham and Northumberland—	
„ foundry	14/6 to 15/-
„ furnace	13/6
Midlands, foundry	—
„ furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	14/- to 14/6
„	28×20 „	—
„	20×10 „	—
„	18¾×14 „	—
C.W.	20×14 „	—
„	28×20 „	—
„	20×10 „	—
„	18¾×14 „	—

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0 to	£7	0	0
Bars, hammered, basis	£16	10	0 to	£17	0	0
Bars and nail-rods, rolled, basis	£15	17	6 to	£16	5	0
Blooms	£10	0	0 to	£12	0	0
Keg steel	£32	0	0 to	£33	0	0
Faggot steel	£18	0	0 to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0 to	£12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

TUBES AND FITTINGS.

Current Discounts.

	Tubes.	*Fittings.*
Gas	62½%	57½%
Water ..	58½%	52½%
Steam ..	55%	47½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

	£	s.	d.		
Oct. 8 ..	34	8	9	inc.	12/6
„ 9 ..	34	7	6	dec.	1/3
„ 12 ..	34	15	0	inc.	7/6
„ 13 ..	35	15	0	„	20/-
„ 14 ..	35	10	0	dec	5/-

Electrolytic Copper.

	£	s.	d.		
Oct. 8 ..	41	0	0	No change	
„ 9 ..	41	0	0	„	„
„ 12 ..	41	0	0	„	„
„ 13 ..	41	10	0	inc.	10/-
„ 14 ..	41	10	0	No change	

Standard Tin (cash).

	£	s.	d.		
Oct. 8 ..	125	0	0	inc.	17/6
„ 9 ..	127	10	0	„	50/-
„ 12 ..	129	0	0	„	30/-
„ 13 ..	130	5	0	„	25/-
„ 14 ..	130	15	0	„	10/-

Tin (English ingots).

	£	s.	d.		
Oct. 8 ..	126	10	0	inc.	15/-
„ 9 ..	129	0	0	„	50/-
„ 12 ..	130	15	0	„	35/-
„ 13 ..	131	15	0	„	20/-
„ 14 ..	132	5	0	„	10/-

Zinc Sheets (English).

	£	s.	d.		
Oct. 8 ..	22	0	0	No change	
„ 9 ..	22	0	0	„	„
„ 12 ..	22	0	0	„	„
„ 13 ..	23	0	0	inc.	20/-
„ 14 ..	23	0	0	No change	

Spelter (ordinary).

	£	s.	d.		
Oct. 8 ..	12	7	6	inc.	3/9
„ 9 ..	12	13	9	„	6/3
„ 12 ..	12	17	6	„	3/9
„ 13 ..	13	0	0	„	2/6
„ 14 ..	12	16	3	dec.	3/9

Lead (English).

	£	s.	d.	
Oct. 8 ..	14	5	0	No change
„ 9 ..	14	10	0	inc. 5/-
„ 12 ..	14	15	0	„ 5/-
„ 13 ..	15	0	0	„ 5/-
„ 14 ..	15	0	0	No change

Imports and Exports of Iron Castings in September and the nine months 1931, compared with September and the nine months 1930.

	September, 1930.	September, 1931.	Nine months, 1930.	Nine months, 1931.	September, 1930.	September, 1931.	Nine months, 1930.	Nine months, 1931.
Imports.	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Pipes and Fittings, Cast	1,213	841	15,386	10,265	14,355	13,240	185,132	132,529
Castings, in the Rough, Iron	124	47	1,757	1,164	2,576	883	37,685	23,438
„ „ „ Steel	847	399	10,586	4,607	21,847	6,976	251,669	97,609
Hollow-ware, Cast, not Enamelled	4	8	26	64	418	419	2,767	4,435
„ „ Enamelled	1	1	18	46	92	282	1,111	2,489
Exports.								
BUILDERS' CASTINGS—								
To Argentine Republic	88	71	1,523	686	5,158	3,959	68,281	32,413
„ British South Africa	173	159	1,751	1,682	6,351	6,912	68,471	62,237
„ „ India	100	82	1,143	1,036	3,666	2,730	42,138	37,586
„ Australia	7	4	243	67	468	424	14,130	3,306
„ New Zealand	63	7	763	285	3,863	433	44,863	17,980
Total (including other countries)	1,216	1,034	13,006	10,020	54,192	46,906	579,034	442,199
PIPES AND FITTINGS—CAST—								
To Argentine Republic	1,021	384	11,830	4,379	10,451	3,256	117,200	42,324
„ British South Africa	1,302	384	7,024	6,084	11,592	4,345	74,300	71,172
„ „ India	110	188	2,286	1,401	2,012	2,835	35,623	22,858
„ Straits Settlements and Malay States	1,067	88	7,945	2,229	9,543	1,383	67,903	24,151
„ Ceylon	35	5	1,203	503	968	83	12,195	6,401
„ Australia	29	6	621	119	603	224	11,486	2,651
Total (including other countries)	7,784	4,315	90,045	54,338	88,958	50,413	994,151	618,716
HOLLOW-WARE—								
Cast, not Enamelled, and Cast, Tinned	301	176	3,023	1,644	10,067	6,341	99,389	57,295
„ Enamelled	77	52	611	401	5,894	4,341	52,744	39,297
CASTINGS, in the rough—								
Iron	140	113	1,800	1,876	4,924	3,866	56,359	42,106
Steel	198	57	1,607	951	7,574	2,749	65,180	33,705

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

CLARENCE CHAMBERS, 39, CORPORATION STREET, BIRMINGHAM.

13, RUMFORD STREET, LIVERPOOL.

PIG IRON

REGISTERED TRADE MARK

All grades FOUNDRY, HEMATITE, BASIC, SPECIALS, &c.

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE.

WILLIAM JACKS & COMPANY,

19, ST. VINCENT PLACE, GLASGOW.

ZETLAND ROAD, MIDDLESBROUGH.

SMALL ADVERTISEMENTS.

Notice.

Small Advertisements in this section of the Journal are accepted at the prepaid rate of 6d. per line, first line in capitals counting two, average 6 words per line. Minimum charge for one insertion 3/-

(A remittance should accompany instructions.)

SITUATIONS WANTED.

FOUNDRY FOREMAN (Non-ferrous) seeks position; 17 years' practical experience art. architectural, and all branches of commercial cast work; first-class refs.—Apply, Box 908, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

PATTERNMAKER DRAUGHTSMAN desires combined post, experimental, petrol, general; good references; moderate salary.—Box 904, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

YOUNG Foundryman, good technical and secondary school education, requires position. Has served full apprenticeship, 8 years' practical experience, all classes of work, in various shops.—Box 890, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

YOUNG TRAVELLER requires post as Representative for foundry and ironwork of any description, having had five years' experience in the foundry; knowledge of machine construction and working drawings. Salary, expenses and commission.—Write, C. E. B., 63, First Avenue, Enfield, Middlesex.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of The Foundry Trade Journal.

Any Member, Associate Member or Associate of the Institute of British Foundrymen who desires his qualifications to be inserted in the column must forward to the General Secretary of the Institute the following information:—(a) Name and address; (b) name of present employer (or last employer if unemployed); (c) brief particulars of qualifications, experience, and type of position required. The name will not be disclosed until the candidate is in communication with a prospective employer. Announcements will be inserted in two successive issues, unless announcers' requirements have been met with in the meantime.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

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Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester.

METAL Patternmaker requires situation. Accustomed to modern plate patterns for large and small ferrous and non-ferrous castings. Textile and motor experience. (148)

PATENTS AND TRADE MARKS.

PROTECT YOUR IDEAS.—Free, "Advice Handbook" on patenting inventions and registering trade marks by Registered Agent with 45 years' experience.—Kings Patent Agency, Limited, 146a, Queen Victoria Street, E.C.4.

PATENTS—*Continued.*

THE Proprietor of British Patent No. 333429, for Cocks and Valves, is desirous of entering into arrangements by way of licence or otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country.—Box 902, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

PROPERTY.

MAGNIFICENT

11 ACRES WORKS SITE.

SHEFFIELD.

145,000 Sq. Ft. of Shops.

SIDING CONNECTIONS

with L.M. & S. and L. & N.E. Rlys.

WELL-BUILT & COMMODIOUS OFFICES

Will Sell whole or in lots to suit customers or Let on favourable terms. Unique opportunity for Manufacturers.

Apply—

THOS. W. WARD, LTD.,
ALBION WORKS, SHEFFIELD.

BRISTOL.

TO Engineers, Founders, Manufacturers.—Fine site of nearly three acres on arterial road, with Foundry and Workshops and own Rail Sidings into the premises. Modern Offices, Warehouses and Workrooms. Central Heating.—Charles A. Tricks & Son, Auctioneers, St. Nicholas Street, Bristol.

PUBLICATION.

RYLAND'S DIRECTORY of the Coal, Iron, Steel, Tinplate, Metal, Engineering, Hardware and Allied Trades. A new edition will be published next January. Secure your advertising space now. Rates on application.—Industrial Newspapers, Ltd., 49, Wellington Street, Strand, London, W.C.2. Telephone: Temple Bar 3951 (5 lines).

MACHINERY.

SAND MIXERS.—New and Secondhand. Ask us to quote.—W. Brealey & Company, Limited, Station Works, Ecclesfield, Sheffield.

THOS. W. WARD, LTD.

New 160-lb. HERCULES Power Hammer, for rounds and squares up to 4½ in.

ROBINSON 30-in. Plane-Iron Grinder.

Several Moulding Machines. Ladles and Rumblers in stock. Ask for list.

One 1928 make 3-ton "COLES" LOCO. STEAM CRANE, 4-ft. 8½-in. gauge; 35-ft. jib; 80 lbs. w.p.; carriage of steel sections.

One 20-ton LOCO. STEAM CRANE (Stothert & Pitt); 67-ft. 6-in. jib; 16-ft. gauge; 100 lbs. w.p.; steel carriage.

Three LANCASHIRE BOILERS, 30 ft. 0 in. x 8 ft. 0 in., re-insure 150 lbs. pressure.

(ASK FOR "ALBION" MACHINERY CATALOGUE.)

ALBION WORKS, SHEFFIELD.

MISCELLANEOUS.

MOTOR-CAR Number-Plate Parts (unassembled).—Quotations are required for quantities of not less than 50,000 letters and numerals per annum of standard size (3½ in. x 2½ in.), cast aluminium.—Only those who have the patterns and past experience need apply, with sample, to "Export," c/o Box 910, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

GANISTER, best quality for cupolas, also for Steel Works.—Astbury Silica Company, "The Brooms," Park Lane, Congleton.

MISCELLANEOUS—*Continued.*

'Phone: 287 SLOUGH

SELECTIONS FROM STOCK

Four adaptable moulding m/cs	£12 each
3 ft. 6 in. "Evans" Sandmill	£15
4 ft. 6 in. "Evans" Sandmill ...	£20
"Jackman" Rotary Sifter ...	£8
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"Jackman" sand whizzer ...	£12
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